U.S. Department of the Interior
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Prepared in cooperation with
U.S. Environmental Protection Agency

Concentrations and Loads of Cadmium, Lead, and Zinc Measured on the Ascending and Descending Limbs of the 1999 Snowmelt-Runoff Hydrographs for Nine Water-Quality Stations, Coeur d'Alene River Basin, Idaho

Open-File Report 00–310

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By Paul F. Woods

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Additional information can be obtained from:

District Chief
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230 Collins Road
Boise, ID 83702-4520
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CONVERSION FACTORS AND OTHER ABBREVIATED UNITS

Multiply	By	To obtain
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
mile (mi)	1.609	kilometer
pound per day (lb/d)	0.4536	kilogram per day
square mile (mi^2)	2.590	square kilometer

Temperature in degrees Celsius (°C) can be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8)\ (°C) + 32$$

Other abbreviated units:

AC-FT	acre-foot
DEG C	degrees Celsius
µg/L, UG/L	microgram per liter
US/CM	microsiemens per centimeter
MG/L	milligram per liter
ML, mL	milliliter
T/DAY	ton per day

Concentrations and Loads of Cadmium, Lead, and Zinc Measured on the Ascending and Descending Limbs of the 1999 Snowmelt-Runoff Hydrographs for Nine Water-Quality Stations, Coeur d’Alene River Basin, Idaho

By Paul F. Woods

Abstract

The Remedial Investigation/Feasibility Study conducted by the U.S. Environmental Protection Agency within the Spokane River Basin of northern Idaho and eastern Washington included extensive data-collection activities to determine the nature and extent of trace-element contamination within the basin. The U.S. Geological Survey designed and implemented synoptic sampling of a high-flow runoff event at selected water-quality stations during the 1999 water year. The objective was to quantify spatial and temporal differences in constituent concentrations and loads over the ascending and descending limbs of a hydrograph depicting a high-flow runoff event. Discharge and water-quality data were collected during spring 1999 snowmelt runoff (May through early June) at nine water-quality stations, one on the North Fork Coeur d’Alene River and eight on the South Fork Coeur d’Alene River. The nine stations were sampled for whole-water recoverable and dissolved concentrations and loads of cadmium, lead, and zinc.

The concentrations and loads sampled during the 1999 snowmelt-runoff event represented near-normal conditions, not flood conditions, in that the recurrence interval for discharge near the hydrograph peak was about 2 years. The general trend among the nine stations was an inverse relation between discharge and dissolved concentrations of cadmium, lead, and zinc, and a direct relation between discharge and whole-water recoverable concentrations of these constituents. The smallest loads of dissolved and whole-water recoverable cadmium, lead, and zinc were measured at South Fork Coeur d’Alene River above Deadman Gulch; constituent concentrations at this site were some of the smallest among those sampled, and discharge was also relatively small. The largest loads of dissolved and whole-water recoverable cadmium, lead, and zinc were measured at South Fork Coeur d’Alene River at Pinehurst; constituent concentrations at this site were large and discharge was the second-largest of all the discharge measurements.

Hysteresis effects on concentrations and loads over the ascending and descending limbs of the snowmelt-runoff hydrograph were quite apparent, especially for whole-water recoverable constituents. Hysteresis is present when a property, such as constituent concentration or load, has different values for a given discharge over the ascending and descending limbs of a hydrograph. During this study, loads of whole-water recoverable constituents on the ascending limb were between 1.5 and 3.6 times larger than those measured on the descending limb at nearly equal discharge. In contrast, dissolved constituents showed minimal hysteresis effects.

INTRODUCTION

Mining and ore-processing activities conducted over the past 100 years in the South Fork Coeur d’Alene River Basin have produced extensive deposits of trace-element-contaminated sediments throughout the South Fork Coeur d’Alene River valley and its tributaries, the channel and flood plain of the main stem Coeur d’Alene

River, and the lakebed of Coeur d'Alene Lake (about 15 mi west of study area boundary, fig. 1, back of report). Snowmelt runoff and occasional floods continue to transport and redistribute trace-element-contaminated sediments throughout the 6,680-mi^2 Spokane River Basin of northern Idaho and eastern Washington.

The U.S. Environmental Protection Agency (EPA) recently initiated a Remedial Investigation/Feasibility Study (RI/FS) of the Spokane River Basin under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), which requires EPA to evaluate contaminant release, fate, and transport. The Remedial Investigation phase involves data collection to characterize site conditions, development of conceptual models, determination of the nature and extent of trace-element contamination, and risk assessment for human health and the environment. The development and evaluation of remedial action alternatives is the focus of the Feasibility Study phase. In March 1998, the EPA asked the U.S. Geological Survey (USGS) to identify hydrologic and water-quality studies the USGS might perform in support of the RI/FS of the Spokane River Basin. The study described in this report was conducted by the USGS as Task 1 (synoptic sampling of a high-flow event on the Coeur d'Alene River system) under Interagency Agreement DW14957278–01–0 with EPA.

The purpose of this report is to quantify spatial and temporal differences in constituent concentrations and loads over the ascending and descending limbs of snowmelt-runoff hydrographs for selected stations in the Coeur d'Alene River Basin. Discharge and water-quality data were collected synoptically during the spring 1999 snowmelt-runoff event (May through early June) at nine water-quality stations, one on the North Fork Coeur d'Alene River (NFCDR) and eight on the South Fork Coeur d'Alene River (SFCDR). Synoptic collection of data involved the simultaneous deployment of multiple sampling crews among the nine stations in order to measure and sample using an identical sampling design.

The results of this synoptic sampling can be used to evaluate the effects of hysteresis on constituent concentrations and loads over the ascending and descending limbs of hydrographs. Hysteresis is present when a property, such as constituent concentration or load, has different values for a given discharge over the ascending and descending limbs of a hydrograph. Hysteresis is largely a result of the initial transport of stored materials within the stream channel or the initial flush of mobile materials from riparian or terrestrial sources (Chang, 1998). The relative magnitude of hysteresis effects can be used to evaluate historical water-quality data for potential bias in constituent concentrations and loads.

APPROACH

Discharge measurements and water-quality samples were collected at the nine USGS water-quality stations listed in table 1 (back of report). The locations of the stations are illustrated in figure 1 in relation to the number or letter preceding each USGS station name.

Discharge measurements were made using standardized USGS methods for collection of streamflow data, computation of discharge, and quality assurance procedures, which are thoroughly described in six USGS Techniques of Water-Resources Investigations Reports (Buchanan and Somers, 1968, 1969; Riggs, 1968; Carter and Davidian, 1968; Kennedy, 1983, 1984). The field sampling plan was to measure discharge near the start of the snowmelt-runoff hydrograph, on the ascending limb, near the peak, and on the descending limb. Discharge measurements were made between May 5 and June 2; 42 measurements were made among the nine stations.

Water-quality samples were collected each time a discharge measurement was made. Water temperature, pH, and specific conductance were measured onsite each time samples were collected. Water-quality samples were collected with nonmetallic samplers and using cross-sectional, depth-integrated sampling procedures described by Edwards and Glysson (1988). The individual samples from the cross-sectional, depth-integrated sampling were composited in a churn splitter and subsamples were withdrawn for laboratory analyses. Samples destined for whole-water recoverable (WWR) analyses were withdrawn initially; samples for dissolved analyses then were withdrawn via a peristaltic pump and nonmetallic filtration apparatus with a filter pore size of 0.45 micrometer (Gelman capsule filters). Each capsule filter had been prerinsed with 1,000 mL of deionized water. Trace-element samples were preserved with 2 mL of Ultrex nitric acid. Water-quality sample collection and field processing were conducted using "clean" protocols that ensure noncontamination at the parts-per-billion level, as described by Horowitz and others (1994). The samples were shipped in plastic coolers that were securely taped, custody-sealed, and logged in on an enclosed chain-of-custody form. The chain-of-custody was quite short—the field personnel shipped the samples directly to the USGS National Water-Quality Laboratory in Denver, Colorado.

The water-quality samples were analyzed for WWR and dissolved concentrations of cadmium, lead, and zinc, as well as hardness, by using low-level detection limit methods described by Fishman and Friedman (1989) and quality assurance/quality control procedures described by Pritt and Raese (1995). A tabulation of analytical results is listed in appendix A (back of report).

The water-quality data were combined with discharge data to compute instantaneous constituent loads on the hydrograph for each station. Instantaneous loads, in pounds per day, were computed by multiplying the following four variables: instantaneous discharge, in cubic feet per second; constituent concentration, in milligrams per liter; a conversion factor of 0.0027 to convert flow and concentration units; and a conversion factor of 2,000 to convert tons to pounds. To facilitate discussion of the data, each station's sample points were plotted on a hydrograph, and concentration and load values were linked to each sample point.

MAGNITUDE OF CONCENTRATIONS AND LOADS AMONG STATIONS

The results of discharge measurements and water-quality sampling at the nine stations are summarized in table 2 (back of report). Dissolved and WWR concentrations, in µg/L, of cadmium among the nine stations ranged, respectively, from 0.02 (Deadman Gulch and Enaville) to 16.2 (Ninemile Creek) and from 0.04 (Deadman Gulch and Enaville) to 16.8 (Ninemile Creek). Dissolved and WWR lead concentrations, in µg/L, ranged, respectively, from 0.06 (Enaville) to 26.3 (Canyon Creek) and from 0.67 (Enaville) to 2,000 (Canyon Creek). Dissolved and WWR concentrations, in µg/L, of zinc ranged, respectively, from 3.49 (Deadman Gulch) to 2,690 (Ninemile Creek) and from 4.36 (Enaville) to 2,580 (Ninemile Creek). The general trend among the nine stations was an inverse relation between discharge and dissolved concentrations of cadmium, lead, and zinc; the smallest concentrations tended to be associated with the largest discharges. In contrast, WWR concentrations of cadmium, lead, and zinc were directly related to discharge; the largest concentrations were associated with the largest discharges.

Among the nine stations, dissolved and WWR loads, in lb/d, of cadmium ranged, respectively, from 0.01 (Deadman Gulch) to 36.2 (Pinehurst) and from 0.02 (Deadman Gulch) to 125 (Pinehurst). Dissolved and WWR lead loads, in lb/d, ranged, respectively, from 0.15 (Deadman Gulch) to 82.8 (Pinehurst) and from 1.09 (Deadman Gulch) to 17,500 (Pinehurst). Dissolved and WWR loads, in lb/d, of zinc ranged, respectively, from 3.08 (Deadman Gulch) to 5,140 (Pinehurst) and from 4.29 (Deadman Gulch) to 15,500 (Pinehurst). The smallest dissolved and WWR loads of cadmium, lead, and zinc usually were measured at South Fork Coeur d'Alene River above Deadman Gulch, corresponding to the relatively small discharge at this site. The largest dissolved and WWR loads of cadmium, lead, and zinc usually were measured at the South Fork Coeur d'Alene River near Pinehurst, corresponding to the second-largest discharge.

Using the data in table 2, the magnitude of loads contributed by each station can be evaluated for selected time intervals. The samples collected in early May, prior to the start of snowmelt runoff, represent relatively stable discharge conditions among the nine stations. The ranking of loads, from low to high, was as follows for WWR cadmium and zinc: Deadman Gulch, Pine Creek, Enaville, Ninemile Creek, Canyon Creek, Silverton, Osburn, Elizabeth Park, and Pinehurst. The pattern of ranking for lead loads was similar to those for cadmium and zinc except that Ninemile Creek was ranked third and Enaville fourth. The ranking of loads near the peak of each snowmelt-runoff hydrograph was similar to those in early May. For WWR cadmium and zinc loads, the ranking, from low to high, was as follows: Deadman Gulch, Pine Creek, Enaville, Ninemile Creek, Canyon Creek, Silverton, Osburn, Elizabeth Park, and Pinehurst. Ranking of lead loads was similar to those for cadmium and zinc except that Elizabeth Park was ranked sixth, Silverton seventh, and Osburn eighth.

VARIATION IN CONCENTRATIONS AND LOADS OVER STATION HYDROGRAPHS

The effect of discharge on the load values is more apparent when the data are plotted on station hydrographs. Figures 2 through 9 (back of report) are hydrographs showing dates of water-quality sample collection, plotted as points along the discharge curve, and listing the concentrations and instantaneous loads associated with each water-quality sample. Note that the sample points do not always plot on the hydrograph curve; the indicated samples are associated with instantaneous discharge measurements, whereas the hydrograph curve depicts mean daily discharge.

The South Fork Coeur d'Alene River above Deadman Gulch was sampled five times during the snowmelt-runoff event (fig. 2). Loads of WWR and dissolved cadmium, lead, and zinc on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 5. The largest loads for the three trace elements were measured near the hydrograph peak on May 25. The load of WWR lead increased by the largest percentage, from 1.09 lb/d on May 5 to 24.9 lb/d on May 25, as a result of a 440-percent increase in concentration and a 320-percent increase in discharge.

Canyon Creek above mouth was sampled four times (fig. 3). Loads of WWR and dissolved cadmium, lead, and zinc on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 5. The largest loads for the three trace elements were measured near the hydrograph peak on May 24. The load of WWR lead increased by the largest percentage, from 24.9 lb/d on May 5 to 4,140 lb/d on May 24, as a result of a 3,500-percent increase in concentration and a 360-percent increase in discharge. WWR loads on the descending limb decreased from the peak because of decreases in discharge coupled with decreases in constituent concentrations. The rate of decrease for dissolved loads on the descending limb was less than that for WWR loads because concentrations either increased or varied little on the descending limb.

Ninemile Creek above mouth was sampled five times (fig. 4). Loads of WWR and dissolved lead on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 5. Although WWR concentrations of lead increased substantially over the hydrograph, concentrations of dissolved lead changed very little. Loads of WWR and dissolved cadmium and zinc measured on only the two sample dates near the hydrograph peak were larger than those measured on the other three sample dates. The largest loads for the three trace elements were measured near the hydrograph peak on May 26. The load of WWR lead increased by the largest percentage, from 9.67 lb/d on May 5 to 534 lb/d on May 26, as a result of a 1,400-percent increase in concentration and a 260-percent increase in discharge. WWR loads on the descending limb decreased because of decreases in discharge coupled with decreases in constituent concentrations. Decreases in discharge were more likely the cause of dissolved load decreases because constituent concentrations either increased or varied little on the descending limb.

The South Fork Coeur d'Alene River at Silverton was sampled five times (fig. 5). Loads of WWR and dissolved cadmium, lead, and zinc on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 5. The largest loads for the three trace elements were measured near the hydrograph peak on May 26. The load of WWR lead increased by the largest percentage, from 44.2 lb/d on May 5 to 4,570 lb/d on May 26, as a result of a 3,050-percent increase in concentration and a 230-percent increase in discharge. WWR loads on the descending limb decreased because of decreases in discharge coupled with decreases in constituent concentrations. Decreases in discharge were more likely the cause of dissolved load decreases because constituent concentrations either increased or varied little on the descending limb.

The hydrograph for South Fork Coeur d'Alene River near Osburn is not included because that station did not record continuous discharge; however, its hydrograph would have been similar to that plotted for South Fork Coeur d'Alene River at Silverton (fig. 5). The Silverton and Osburn stations were sampled on the same dates; discharge was about 15 percent larger at Osburn (table 1). Loads of WWR and dissolved cadmium, lead, and zinc on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 5. The largest loads for the three trace elements were measured near the hydrograph peak on May 26. The load of WWR lead increased by the largest percentage, from 47.1 lb/d on May 5 to 5,000 lb/d on May 26, as a result of a 2,950-percent increase in concentration and a 250-percent increase in discharge. WWR loads on the descending limb decreased from the peak because of decreases in discharge coupled with decreases in constituent concentrations. Decreases in discharge were more likely the cause of dissolved load decreases because constituent concentrations either increased or varied little on the descending limb.

The South Fork Coeur d'Alene River at Elizabeth Park was sampled four times (fig. 6). Loads of WWR and dissolved cadmium, lead, and zinc on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 6, except that the June 1 load of dissolved zinc was less than that of May 6. The largest loads for the three trace elements were measured near the hydrograph peak on May 25. The load of WWR lead increased by the largest percentage, from 57.9 lb/d on May 6 to 4,460 lb/d on May 25, as a result of a 1,980-percent increase in concentration and a 270-percent increase in discharge. WWR loads on the descending limb decreased because of decreases in discharge coupled with decreases in constituent concentrations. Decreases in discharge were more likely the cause of the dissolved load decreases because constituent concentrations either increased or varied little on the descending limb.

Pine Creek below Amy Gulch was sampled five times (fig. 7). Loads of WWR lead on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 6; cadmium and zinc loads were similar, except that the June 1 loads were less than those of May 6. The largest loads for the three trace elements were measured near the hydrograph peak on May 25. The load of WWR lead increased by the largest percentage, from 1.5 lb/d on May 6 to 226 lb/d on May 25, as a result of a 3,250-percent increase in concentration and a 270-percent increase in discharge. WWR loads on the descending limb decreased because of decreases in discharge coupled with decreases in constituent concentrations. Decreases in discharge were more likely the cause of dissolved load decreases because constituent concentrations either increased or varied little on the descending limb.

The South Fork Coeur d'Alene River at Pinehurst was sampled four times (fig. 8). Loads of WWR and dissolved cadmium, lead, and zinc on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 6. The largest loads for the three trace elements were measured near the hydrograph peak on May 25. The load of WWR lead increased by the largest percentage, from 271 lb/d on May 6 to 17,500 lb/d on May 25, as a result of a 1,650-percent increase in concentration and a 270-percent increase in discharge. WWR loads on the descending limb decreased because of decreases in discharge coupled with decreases in constituent concentrations. Decreases in discharge were more likely the cause of dissolved load decreases because constituent concentrations either increased or varied little on the descending limb.

The North Fork Coeur d'Alene River at Enaville was sampled five times (fig. 9). Loads of WWR cadmium, lead, and zinc on the ascending and descending limbs of the hydrograph were larger than those measured on the prerunoff sample date of May 6, except that WWR cadmium and zinc loads on June 2 were less than those on May 6. The largest loads for WWR and dissolved cadmium, lead, and zinc were measured near the hydrograph peak on May 25. The load of WWR lead increased by the largest percentage, from 20.6 lb/d on May 6 to 674 lb/d on May 25, as a result of a 1,340-percent increase in concentration and a 125-percent increase in discharge. WWR loads on the descending limb decreased because of decreases in discharge coupled with decreases in constituent concentrations. Decreases in discharge were more likely the cause of dissolved load decreases because constituent concentrations either increased or varied little on the descending limb.

HYSTERESIS EFFECTS ON CONCENTRATIONS AND LOADS

Hysteresis effects were most apparent at three of the stations (Ninemile Creek and South Fork Coeur d'Alene River at Silverton and near Osburn) because concentrations and loads on the ascending and descending limbs of the hydrographs were measured when discharge was nearly equal. Hysteresis effects were not as apparent at the other six stations because discharge on the ascending and descending hydrograph limbs was not similar. However, hysteresis effects were likely to have been present at those stations because the hydrologic processes among the nine stations were similar. For Ninemile Creek, the effect of hysteresis is readily apparent for the samples on May 23 on the ascending limb and May 31 on the descending limb (fig. 4). Although instantaneous discharge was nearly equal (61 and 55 ft^3/s, respectively), loads of WWR constituents were 1.5 to 2.4 times larger on the ascending limb because of differences in constituent concentrations measured on the two sample dates. Loads of dissolved constituents on the ascending limb were 1.2 to 1.4 times larger than those on the descending limb. The effect of hysteresis at South Fork Coeur d'Alene River at Silverton is apparent for the samples on May 24 on the ascending limb and May 27 on the descending limb (fig. 5). Although instantaneous discharge was nearly equal (1,220 and 1,230 ft^3/s, respectively), loads of WWR constituents were about 1.5 to 3.6 times larger on the ascending limb because of differences in constituent concentrations measured on the two sample dates. Loads and concentrations of dissolved constituents measured on these two dates were nearly equal. At South Fork Coeur d'Alene River near Osburn, the effect of hysteresis is apparent for the samples on May 24 on the ascending limb and May 27 on the descending limb (table 1). Although instantaneous discharge was nearly equal (1,390 and 1,370 ft^3/s, respectively), loads of WWR constituents were 1.5 to 2.4 times larger on the ascending limb because of differences in constituent concentrations measured on the two sample dates. Loads and concentrations of dissolved cadmium and zinc were nearly equal, whereas the load of dissolved lead was 1.3 times larger on the ascending limb.

In that hysteresis is largely a result of the initial transport of stored materials within the stream channel and (or) the initial flush of mobile materials from riparian or terrestrial sources (Chang, 1998), the magnitude of the hysteresis effect can be affected by antecedent conditions, as well as by the magnitude of the discharge event generating hysteresis. As an example, a lack of channel-flushing discharges over the summer and autumn months may allow the accrual of stored sediments, which could be mobilized by the first significant discharge event and thereby yield a large hysteresis effect. After this first event, the hysteresis effect in subsequent events might be muted because of a paucity of stored sediments within the stream channel. As the recurrence interval of a discharge event becomes larger, the potential for channel scour and input of riparian and flood-plain sediments increases. In the case of the 1999 snowmelt-runoff event in the Coeur d'Alene River Basin, the magnitude of the hysteresis effect was likely muted because an antecedent storm occurred in the basin in April. Additionally, bankfull and overbank flows did not occur because the recurrence interval of the snowmelt-runoff event was only about 2 years. The recurrence interval is based on a statistical analysis of the long-term record at USGS station 12413000, North Fork Coeur d'Alene River at Enaville (Kjelstrom and others, 1996).

The insight on hysteresis effects gained by this particular study can be applied to evaluations of water-quality data for the RI/FS of the Spokane River Basin. Water-quality samples collected in conjunction with a continuous record of discharge can be evaluated as to potential bias on the basis of whether they were collected on the ascending or descending limb of the hydrograph. Evaluations based on WWR concentrations of sediment-associated constituents, such as lead, collected on the descending limb are likely to result in significant underestimation of the load carried during the sampled hydrologic event. The partitioning of load sources along a stream reach may be inaccurate if upstream and downstream samples for determining constituent concentrations are collected on different limbs of the hydrograph. For example, if concentrations at the upstream station are collected on the descending limb of the hydrograph but concentrations at the downstream station are collected on the ascending limb, the increase in load downstream may be an artifact caused by hysteresis. Conversely, if concentrations are collected on the ascending limb at the upstream station and on the descending limb at the downstream station, an artificial reduction in load may be incorrectly surmised. This latter case has implications for monitoring the effectiveness of remediation actions in that knowledge of hysteresis effects is desirable for realistic evaluation of changes in loads between monitoring stations upstream and downstream from the remediation activities.

REFERENCES CITED

Buchanan, T.J., and Somers, W.P., 1968, Stage measurement at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chap. A7, 28 p.

——— 1969, Discharge measurements at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chap. A8, 65 p.

Carter, R.W., and Davidian, J., 1968, General procedure for gaging streams: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chap. A6, 13 p.

Chang, H.H., 1998, Fluvial processes in river engineering: Malabar, Fla., Krieger Publishing Co., 432 p.

Edwards, T.K., and Glysson, G.D., 1988, Field methods for measurement of fluvial sediment: U.S. Geological Survey Open-File Report 86–531, 118 p.

Fishman, M.J., and Friedman, L.C., eds., 1989, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, book 5, chap. A1, 545 p.

Horowitz, A.J., Demas, C.R., Fitzgerald, K.K., Miller, T.L., and Rickert, D.A., 1994, U.S. Geological Survey protocol for the collection and processing of surface-water samples for the subsequent determination of inorganic constituents in filtered water: U.S. Geological Survey Open-File Report 94–539, 57 p.

Kennedy, E.J., 1983, Computation of continuous records of streamflow: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chap. A13, 53 p.

——— 1984, Discharge ratings at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chap. A10, 59 p.

Kjelstrom, L.C., Stone, M.A.J., and Harenberg, W.A., 1996, Statistical summaries of streamflow data for selected gaging stations in Idaho and adjacent States through September 1990—Volume 1: Gaging stations with 10 or more years of record: U.S. Geological Survey Water-Resources Investigations Report 94–4069, 533 p.

Pritt, J.W., and Raese, J.W., eds., 1995, Quality assurance/quality control manual, National Water-Quality Laboratory: U.S. Geological Survey Open-File Report 95–443, 35 p.

Riggs, H.C., 1968, Some statistical tools in hydrology: U.S. Geological Survey Techniques of Water-Resources Investigations, book 4, chap. A1, 39 p.

Figures 1–9

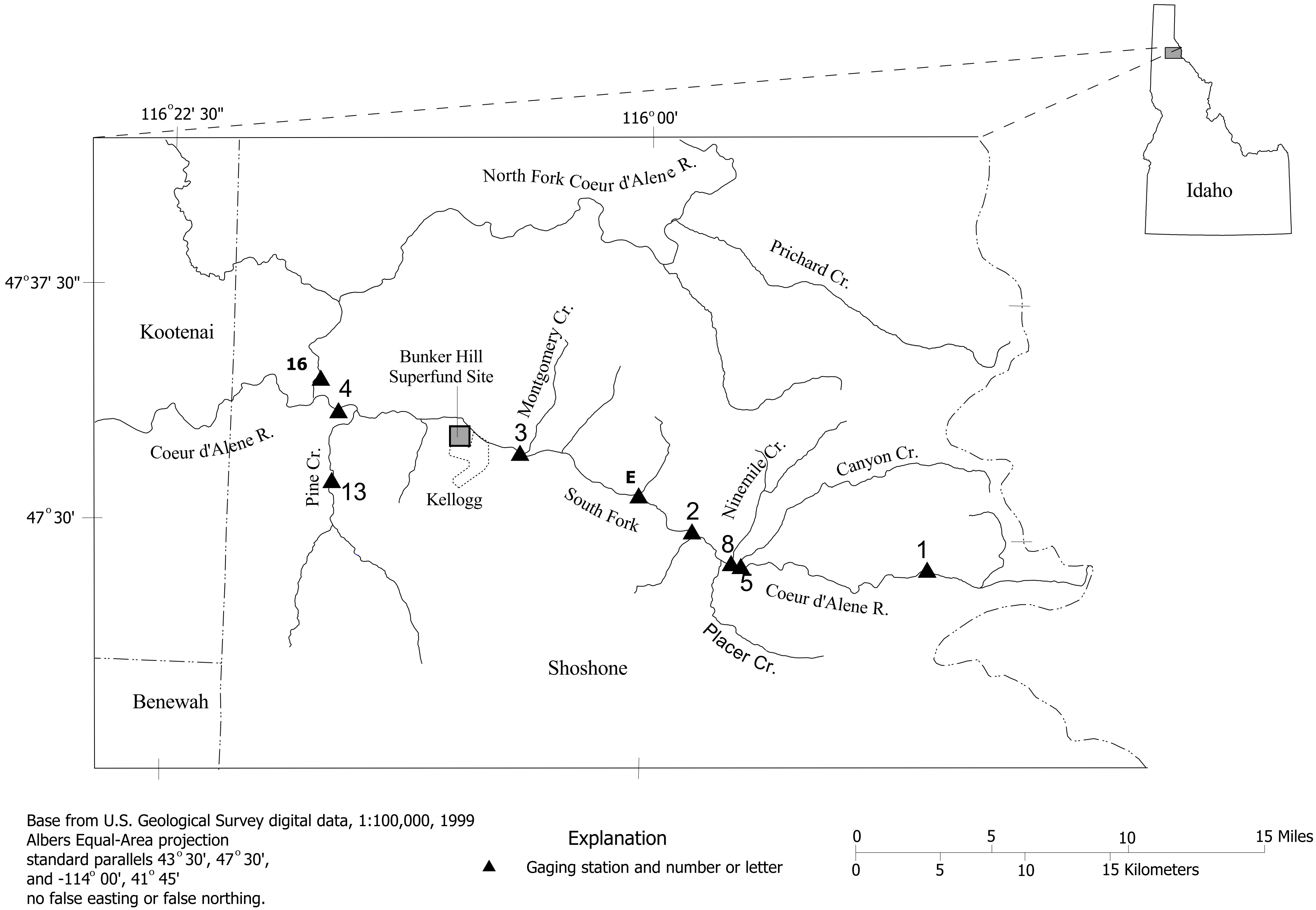

Figure 1. Locations of nine water-quality stations monitored over hydrographs of spring 1999 snowmelt runoff within Coeur d'Alene River Basin, Idaho.

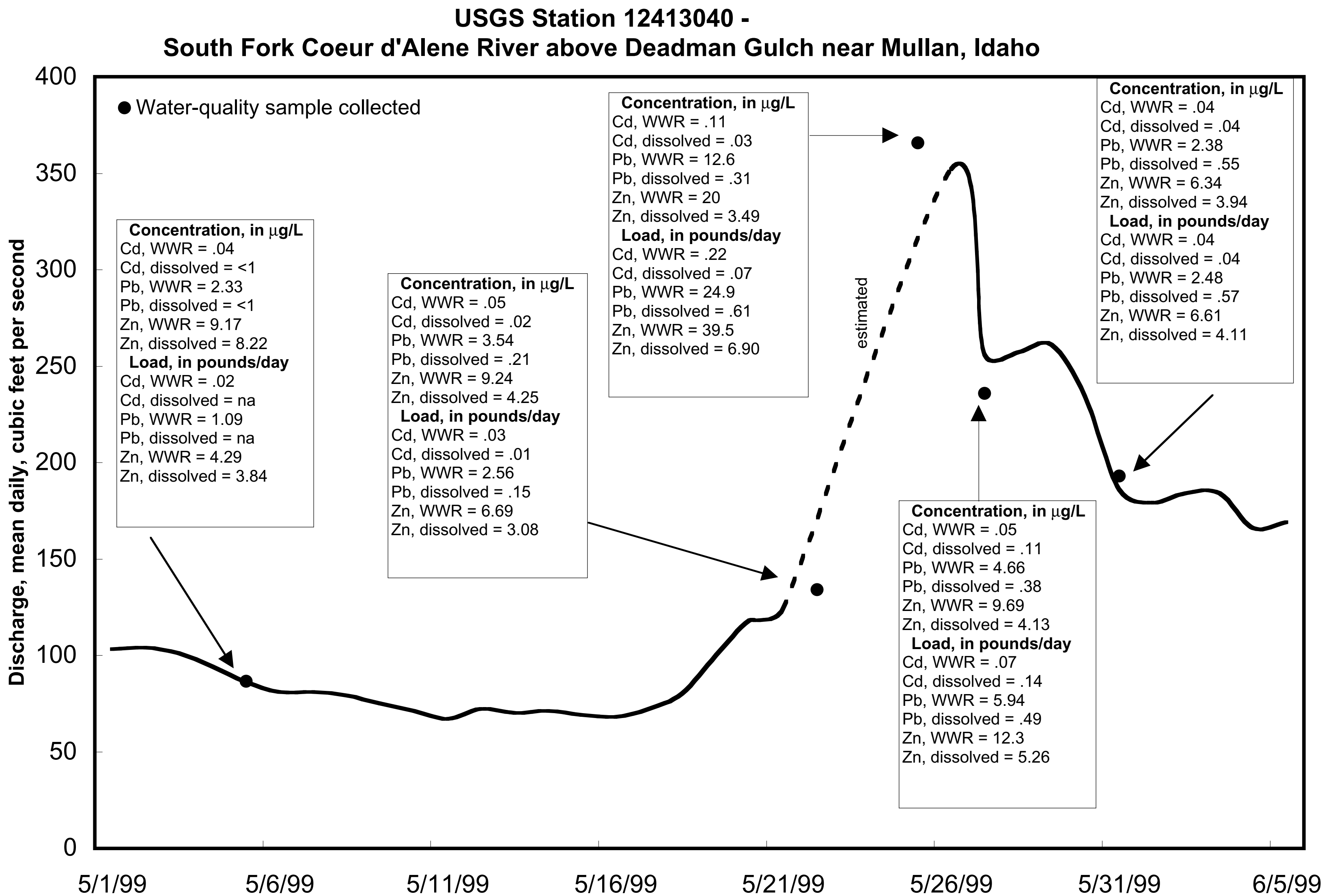

Figure 2. 1999 snowmelt-runoff hydrograph with concentrations and loads of cadmium, lead, and zinc at South Fork Coeur d'Alene River above Deadman Gulch near Mullan, Idaho. (USGS, U.S. Geological Survey; WWR, whole-water recoverable; µg/L, micrograms per liter; na, not applicable; <, less than)

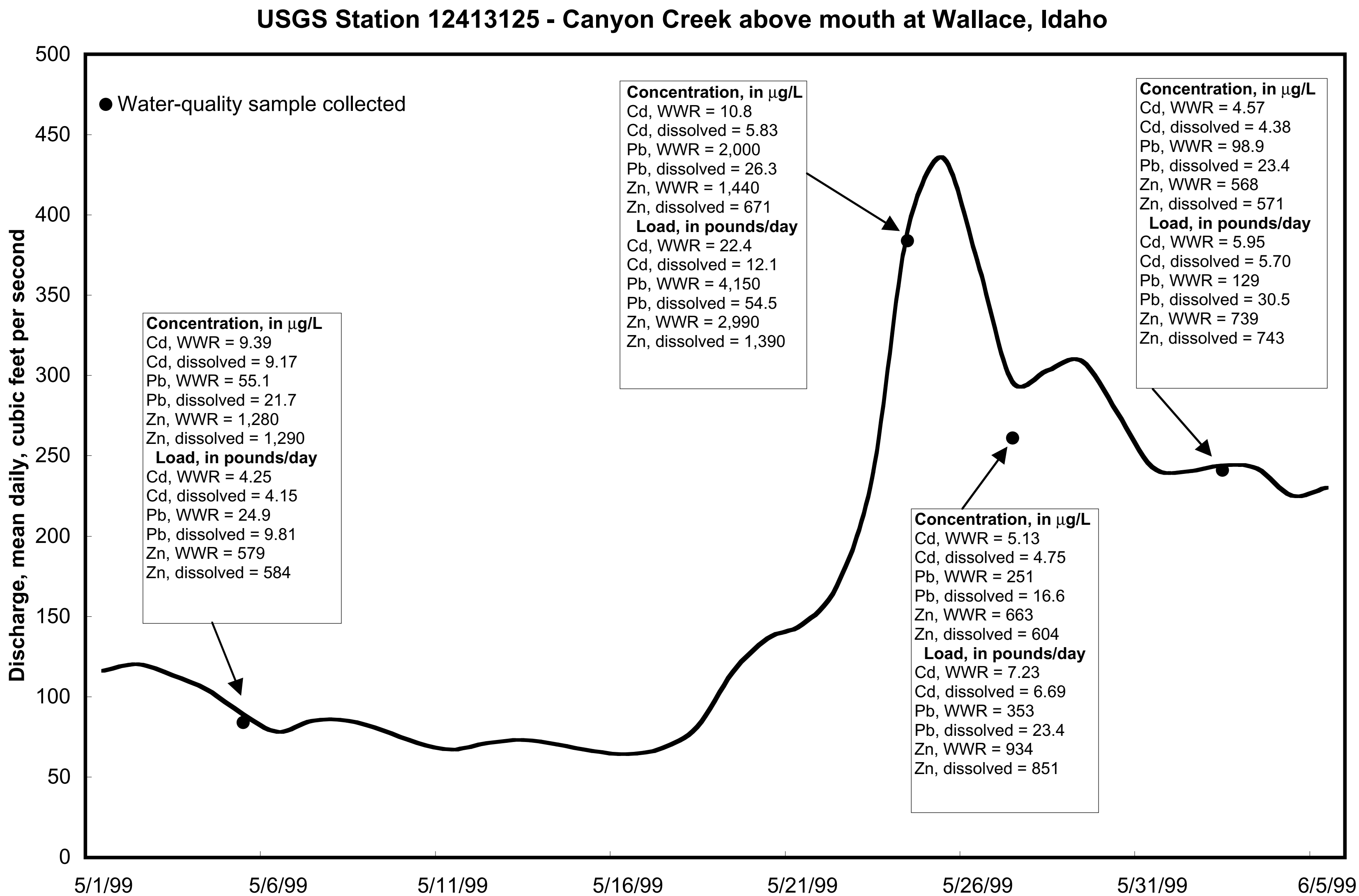

Figure 3. 1999 snowmelt-runoff hydrograph with concentrations and loads of cadmium, lead, and zinc at Canyon Creek above mouth at Wallace, Idaho.
(USGS, U.S. Geological Survey; WWR, whole-water recoverable; µg/L, micrograms per liter)

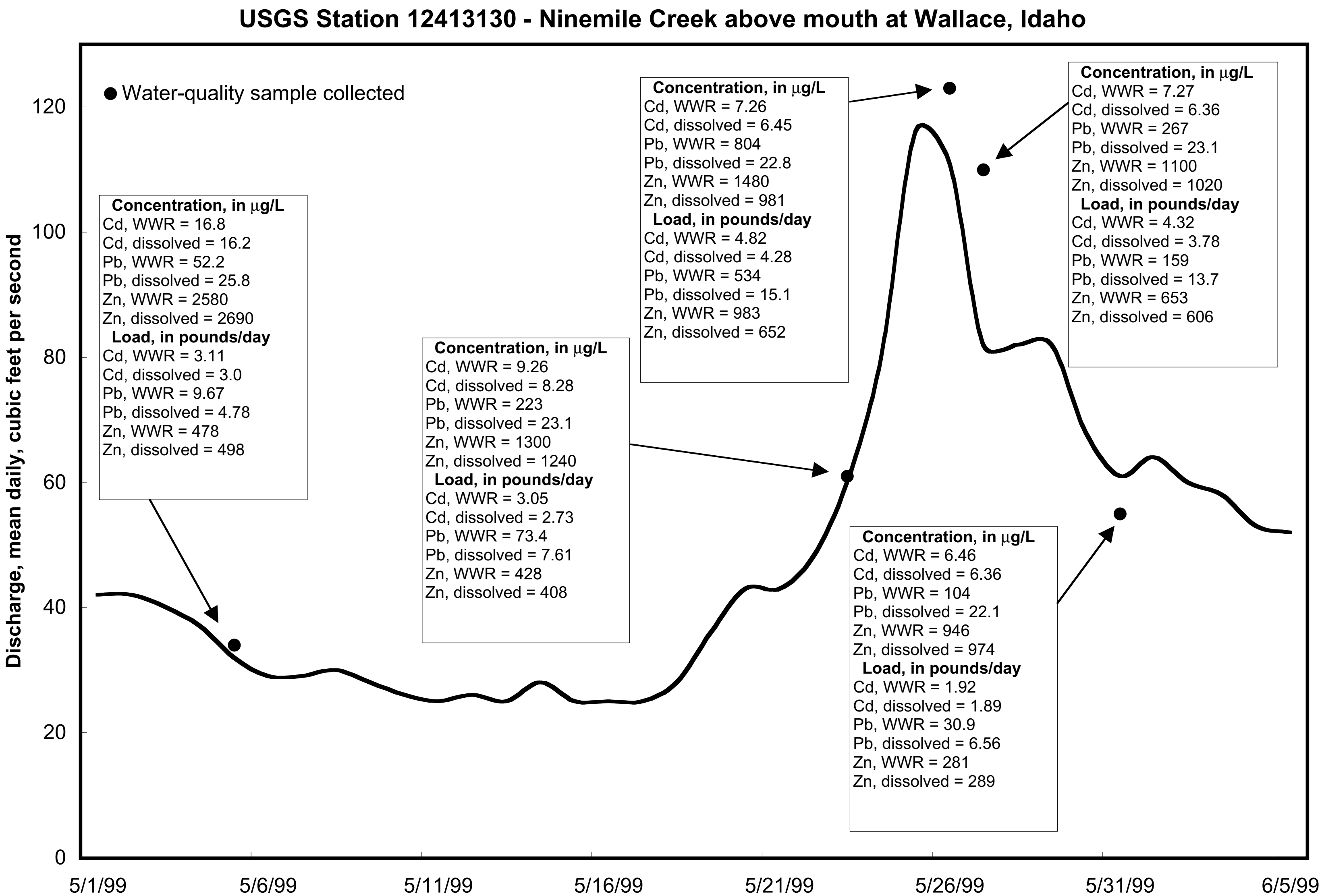

Figure 4. 1999 snowmelt-runoff hydrograph with concentrations and loads of cadmium, lead, and zinc at Ninemile Creek above mouth at Wallace, Idaho.
(USGS, U.S. Geological Survey; WWR, whole-water recoverable; µg/L, micrograms per liter)

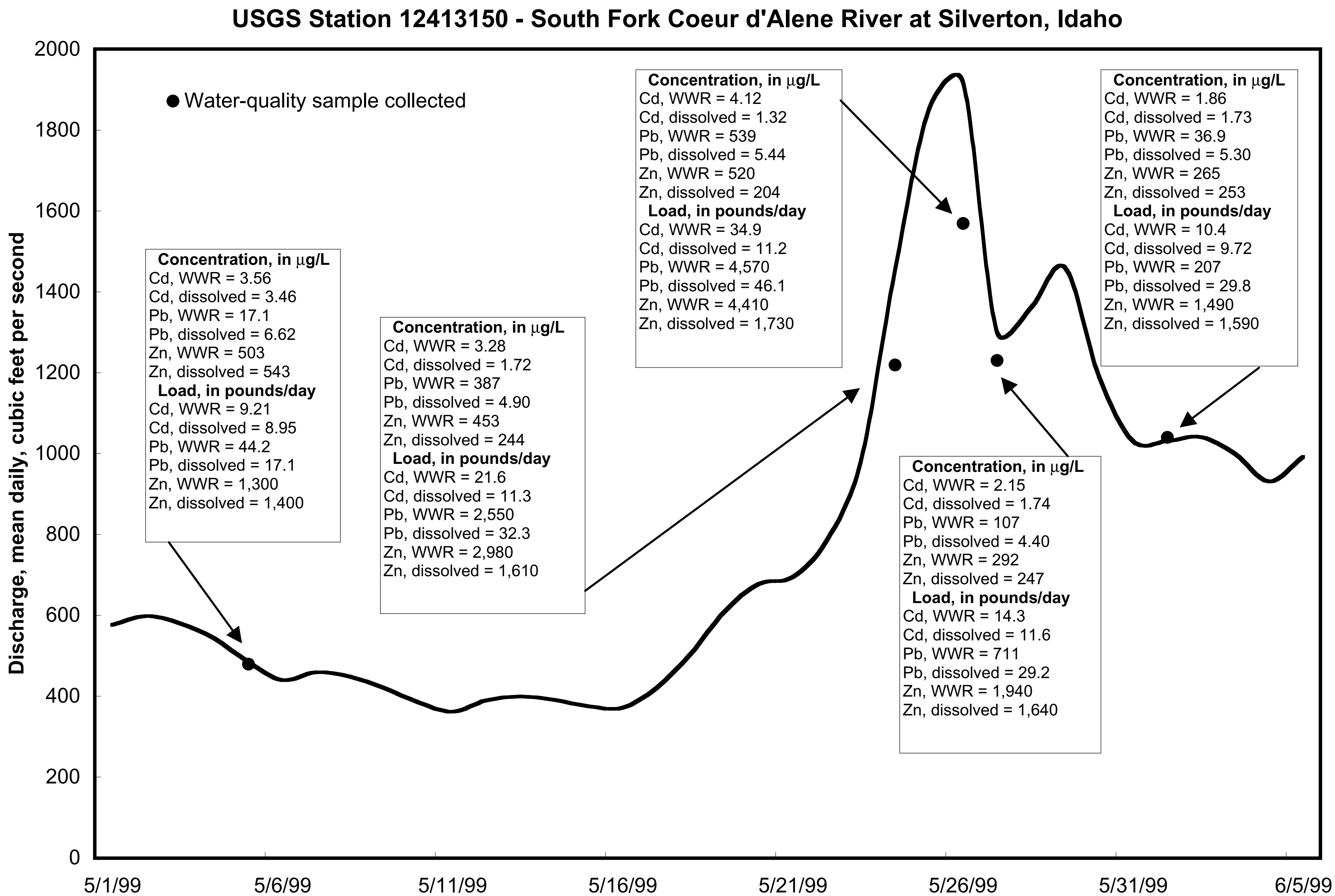

Figure 5. 1999 snowmelt-runoff hydrograph with concentrations and loads of cadmium, lead, and zinc at South Fork Coeur d'Alene River at Silverton, Idaho.
(USGS, U.S. Geological Survey; WWR, whole-water recoverable; µg/L, micrograms per liter)

USGS Station 12413210 -
South Fork Coeur d'Alene River at Elizabeth Park near Kellogg, Idaho

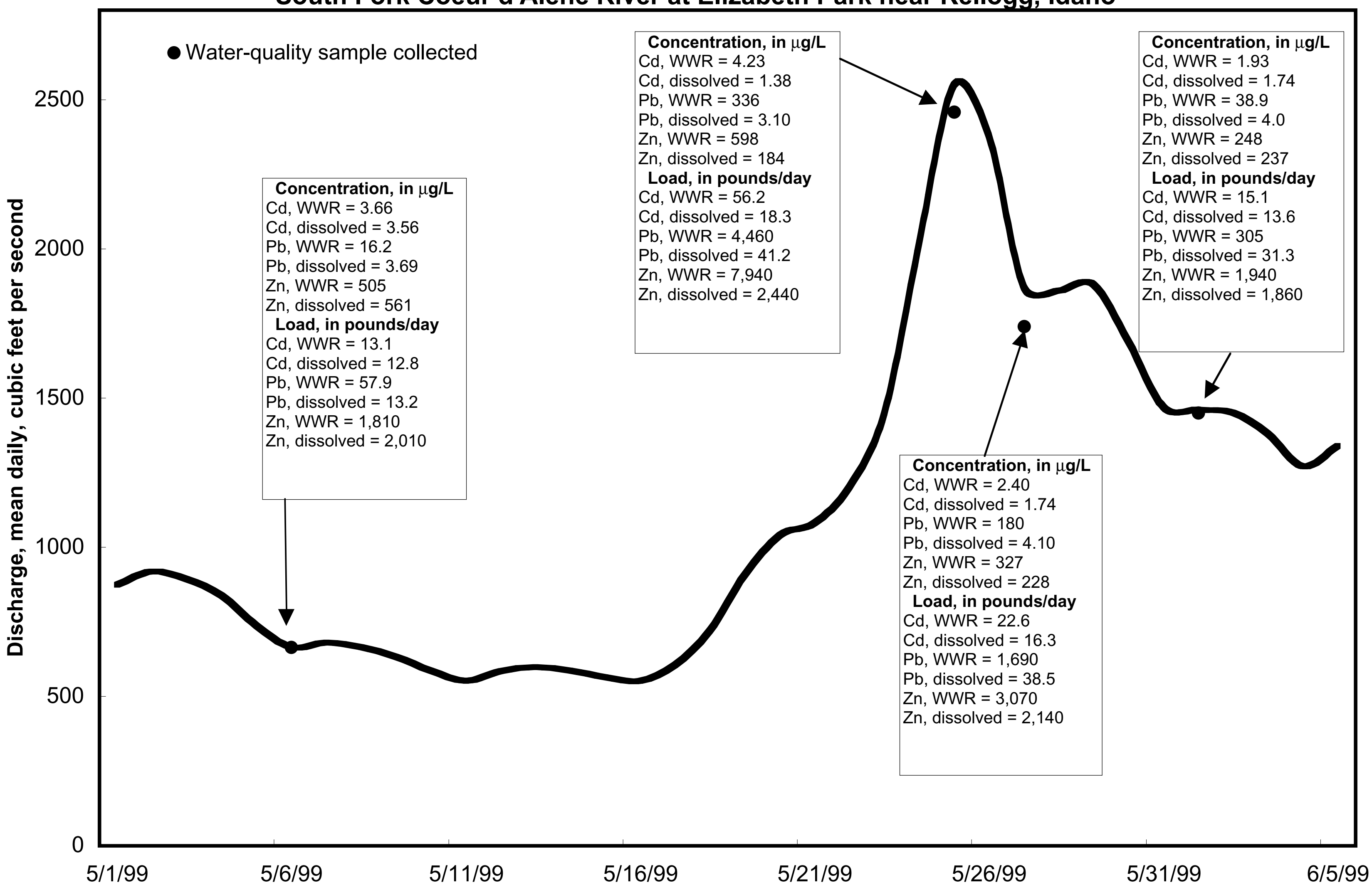

Figure 6. 1999 snowmelt-runoff hydrograph with concentrations and loads of cadmium, lead, and zinc at South Fork Coeur d'Alene River at Elizabeth Park near Kellogg, Idaho. (USGS, U.S. Geological Survey; WWR, whole-water recoverable; µg/L, micrograms per liter)

USGS Station 12413445 - Pine Creek below Amy Gulch near Pinehurst, Idaho

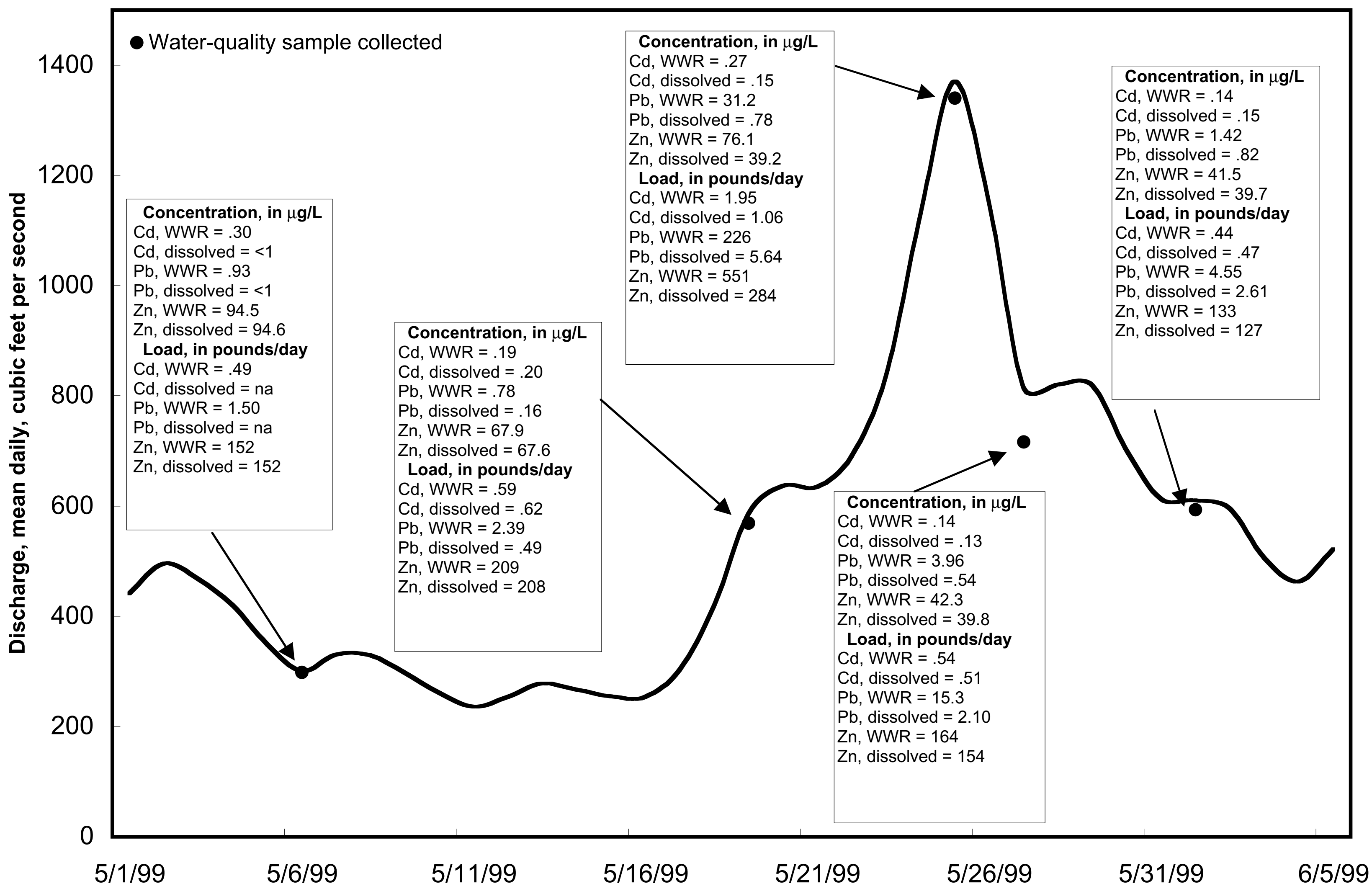

Figure 7. 1999 snowmelt-runoff hydrograph with concentrations and loads of cadmium, lead, and zinc at Pine Creek below Amy Gulch near Pinehurst, Idaho.
(USGS, U.S. Geological Survey; WWR, whole-water recoverable; µg/L, micrograms per liter; na, not applicable; <, less than)

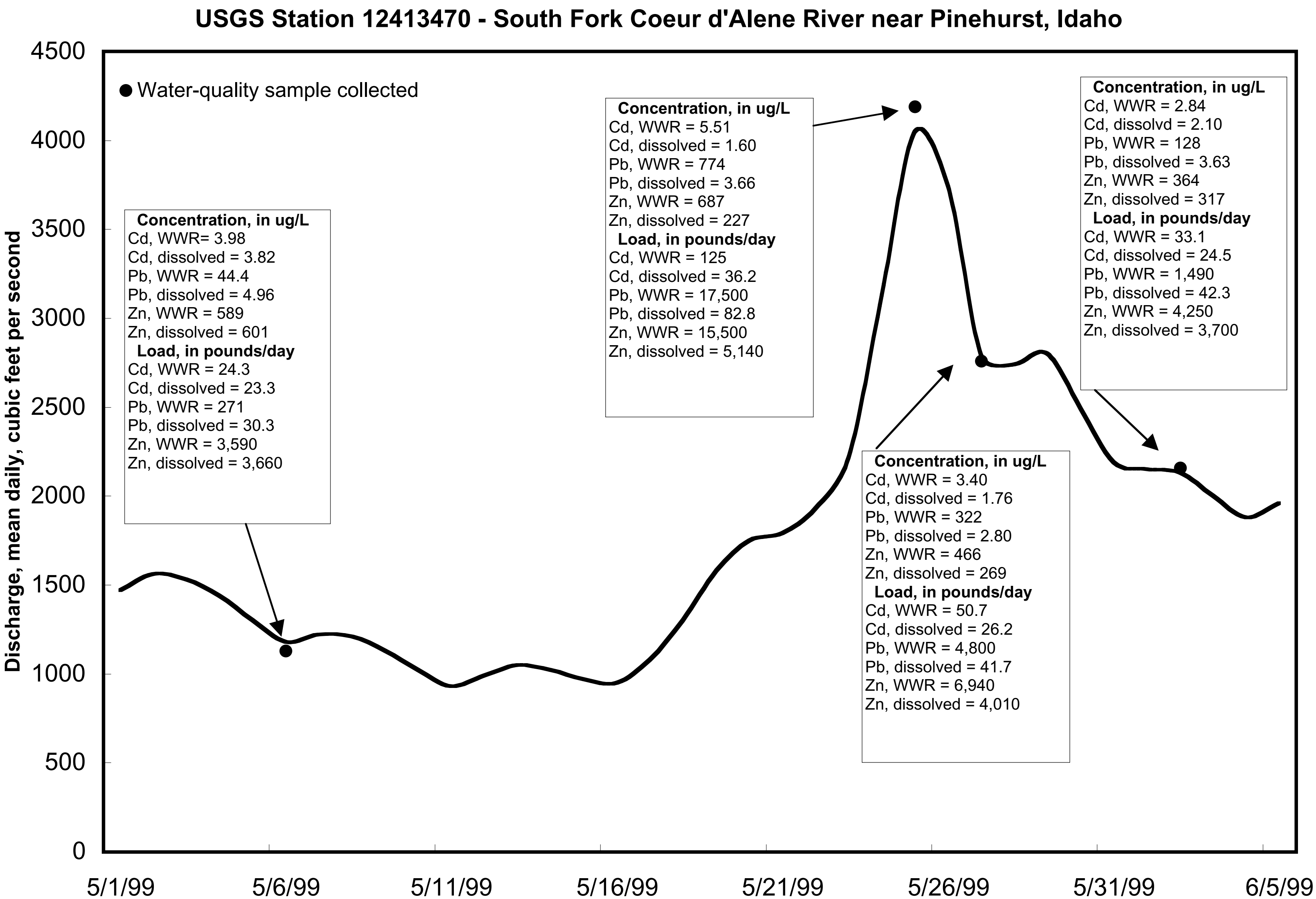

Figure 8. 1999 snowmelt-runoff hydrograph with concentrations and loads of cadmium, lead, and zinc at South Fork Coeur d'Alene River near Pinehurst, Idaho.
(USGS, U.S. Geological Survey; WWR, whole-water recoverable; μg/L, micrograms per liter)

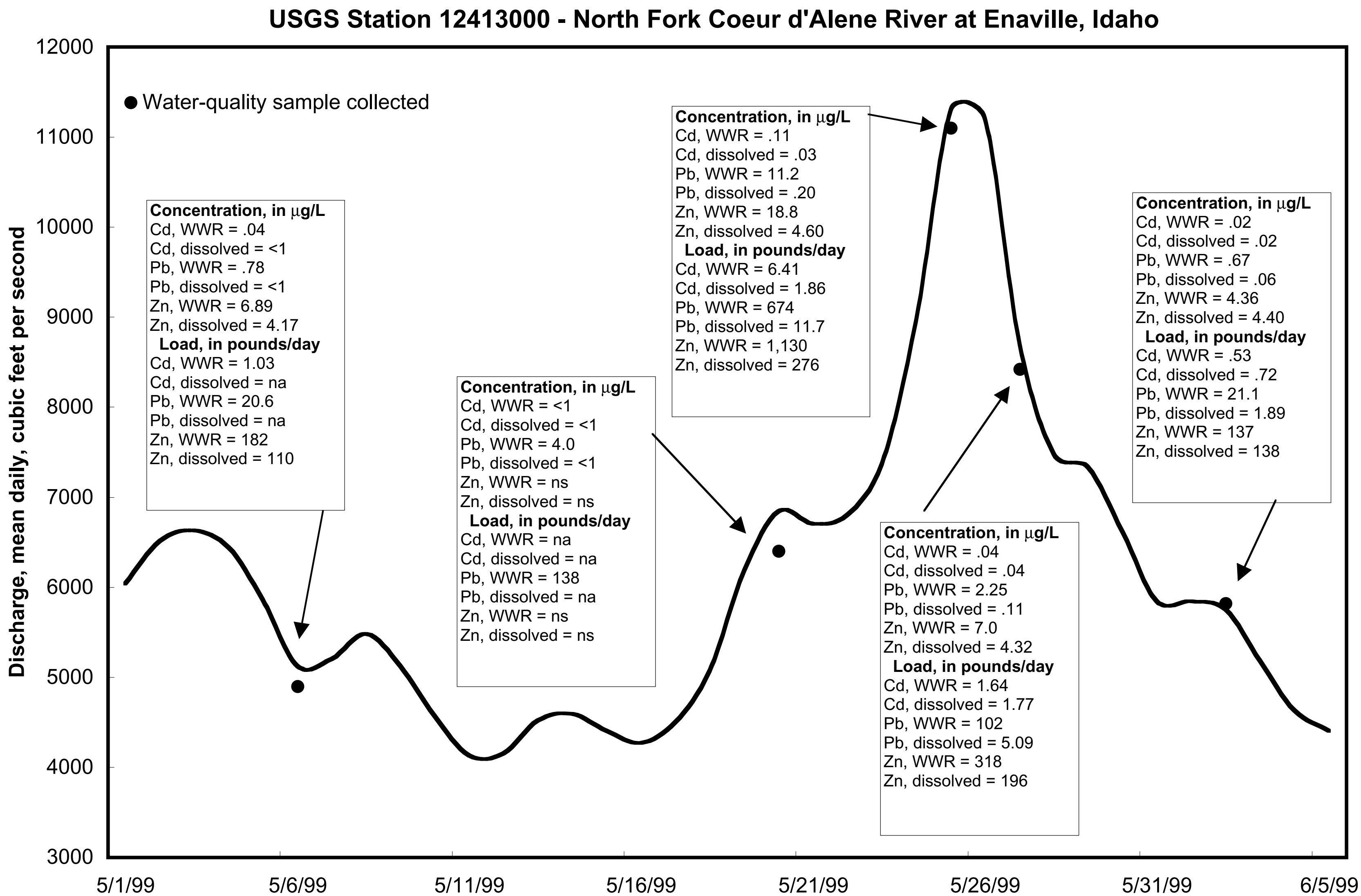

Figure 9. 1999 snowmelt-runoff hydrograph with concentrations and loads of cadmium, lead, and zinc at North Fork Coeur d'Alene River at Enaville, Idaho.
(USGS, U.S. Geological Survey; WWR, whole-water recoverable; µg/L, micrograms per liter; na, not applicable; ns, not sampled; <less than)

Table 1

Table 1. Names and identification numbers of nine U.S. Geological Survey water-quality stations monitored during the 1999 snowmelt runoff, Coeur d'Alene River Basin, Idaho.

Number or letter of station on figure 1	U.S. Geological Survey water-quality station	
	Number	Name
1	12413040	South Fork Coeur d'Alene River above Deadman Gulch near Mullan
2	12413150	South Fork Coeur d'Alene River at Silverton
E	12413169	South Fork Coeur d'Alene River below Twomile Creek near Osburn
3	12413210	South Fork Coeur d'Alene River at Elizabeth Park near Kellogg
4	12413470	South Fork Coeur d'Alene River near Pinehurst
5	12413125	Canyon Creek above mouth at Wallace
8	12413130	Ninemile Creek above mouth at Wallace
13	12413445	Pine Creek below Amy Gulch near Pinehurst
16	12413000	North Fork Coeur d'Alene River at Enaville

Table 2

Table 2. Concentrations and instantaneous loads of cadmium, lead, and zinc measured during 1999 snowmelt runoff at nine water-quality stations on the North and South Forks of the Coeur d'Alene River, Idaho

[NFCDR, North Fork Coeur d'Alene River; SFCDR, South Fork Coeur d'Alene River; ns, not sampled; na, not applicable; µg/L, micrograms per liter; ft^3/s, cubic feet per second; Inst. Q, instantaneous discharge; WWR, whole-water recoverable; DISS, dissolved; USGS, U.S. Geological Survey]

USGS Station Number	Station Name	Sample Date	Inst. Q (ft^3/s)	Cadmium Concentration (µg/L) and Instantaneous Load (pounds/day)				Lead Concentration (µg/L) and Instantaneous Load (pounds/day)				Zinc Concentration (µg/L) and Instantaneous Load (pounds/day)			
				Load WWR	WWR[1]	Load DISS	DISS[2]	Load WWR	WWR[1]	Load DISS	DISS[2]	Load WWR	WWR[1]	Load DISS	DISS[2]
12413040	SFCDR above Deadman Gulch near Mullan	5/5/99	86.6	0.02	0.04	na	<1	1.09	2.33	na	<1	4.29	9.17	3.84	8.22
		5/22/99	134	0.03	0.05	0.01	0.02	2.56	3.54	0.15	0.21	6.69	9.24	3.08	4.25
		5/25/99	366	0.22	0.11	0.07	0.03	24.9	12.6	0.61	0.31	39.5	20	6.90	3.49
		5/27/99	236	0.07	0.05	0.14	0.11	5.94	4.66	0.49	0.38	12.3	9.69	5.26	4.13
		5/31/99	193	0.04	0.04	0.04	0.04	2.48	2.38	0.57	0.55	6.61	6.34	4.11	3.94
12413125	Canyon Creek above mouth at Wallace	5/5/99	83.8	4.25	9.39	4.15	9.17	24.9	55.1	9.81	21.7	579	1280	584	1290
		5/24/99	384	22.4	10.8	12.1	5.83	4150	2000	54.5	26.3	2990	1440	1390	671
		5/27/99	261	7.23	5.13	6.69	4.75	353	251	23.4	16.6	934	663	851	604
		6/2/99	241	5.95	4.57	5.70	4.38	129	98.9	30.5	23.4	739	568	743	571
12413130	Ninemile Creek above mouth at Wallace	5/5/99	34.3	3.11	16.8	3.0	16.2	9.67	52.2	4.78	25.8	478	2580	498	2690
		5/23/99	61	3.05	9.26	2.73	8.28	73.4	223	7.61	23.1	428	1300	408	1240
		5/26/99	123	4.82	7.26	4.28	6.45	534	804	15.1	22.8	983	1480	652	981
		5/27/99	110	4.32	7.27	3.78	6.36	159	267	13.7	23.1	653	1100	606	1020
		5/31/99	55	1.92	6.46	1.89	6.36	30.9	104	6.56	22.1	281	946	289	974
12413150	SFCDR at Silverton	5/5/99	479	9.21	3.56	8.95	3.46	44.2	17.1	17.1	6.62	1300	503	1400	543
		5/24/99	1220	21.6	3.28	11.3	1.72	2550	387	32.3	4.90	2980	453	1610	244
		5/26/99	1570	34.9	4.12	11.2	1.32	4570	539	46.1	5.44	4410	520	1730	204
		5/27/99	1230	14.3	2.15	11.6	1.74	711	107	29.2	4.40	1940	292	1640	247
		6/1/99	1040	10.4	1.86	9.72	1.73	207	36.9	29.8	5.30	1490	265	1590	253

USGS Station Number	Station Name	Sample Date	Inst. Q (ft^3/s)	Cadmium Concentration (µg/L) and Instantaneous Load (pounds/day)				Lead Concentration (µg/L) and Instantaneous Load (pounds/day)				Zinc Concentration (µg/L) and Instantaneous Load (pounds/day)			
				Load WWR	WWR[1]	Load DISS	DISS[2]	Load WWR	WWR[1]	Load DISS	DISS[2]	Load WWR	WWR[1]	Load DISS	DISS[2]
12413169	SFCDR below Twomile Creek near Osburn	5/5/99	533	11	3.81	10.6	3.69	47.1	16.4	17.8	6.17	1460	507	1590	552
		5/24/99	1390	27.2	3.62	13.8	1.84	2820	376	39.8	5.30	3760	501	1880	250
		5/26/99	1850	38.7	3.87	15.8	1.58	5000	500	44.3	4.43	6280	629	2230	223
		5/27/99	1370	18.2	2.46	14.4	1.95	1180	159	30.2	4.08	2560	346	1900	257
		6/1/99	999	11.2	2.08	10.7	1.99	210	38.9	30.5	5.65	1530	284	1450	268
12413210	SFCDR at Elizabeth Park near Kellogg	5/6/99	664	13.1	3.66	12.8	3.56	57.9	16.2	13.2	3.69	1810	505	2010	561
		5/25/99	2460	56.2	4.23	18.3	1.38	4460	336	41.2	3.10	7940	598	2440	184
		5/27/99	1740	22.6	2.40	16.3	1.74	1690	180	38.5	4.10	3070	327	2140	228
		6/1/99	1450	15.1	1.93	13.6	1.74	305	38.9	31.3	4.0	1940	248	1860	237
12413445	Pine Creek below Amy Gulch near Pinehurst	5/6/99	298	0.49	0.30	na	<1	1.50	0.93	na	<1	152	94.5	152	94.6
		5/19/99	569	0.59	0.19	0.62	0.20	2.39	0.78	0.49	0.16	209	67.9	208	67.6
		5/25/99	1340	1.95	0.27	1.06	0.15	226	31.2	5.64	0.78	551	76.1	284	39.2
		5/27/99	716	0.54	0.14	0.51	0.13	15.3	3.96	2.10	0.54	164	42.3	154	39.8
		6/1/99	593	0.44	0.14	0.47	0.15	4.55	1.42	2.61	0.82	133	41.5	127	39.7
12413470	SFCDR near Pinehurst	5/6/99	1130	24.3	3.98	23.3	3.82	271	44.4	30.3	4.96	3590	589	3660	601
		5/25/99	4190	125	5.51	36.2	1.60	17500	774	82.8	3.66	15500	687	5140	227
		5/27/99	2760	50.7	3.40	26.2	1.76	4800	322	41.7	2.80	6940	466	4010	269
		6/2/99	2160	33.1	2.84	24.5	2.10	1490	128	42.3	3.63	4250	364	3700	317
12413000	NFCDR at Enaville	5/6/99	4900	1.03	0.04	na	<1	20.6	0.78	na	<1	182	6.89	110	4.17
		5/20/99	6400	na	<1	na	<1	138	4.00	na	<1	na	ns	na	ns
		5/25/99	11100	6.41	0.11	1.86	0.03	671	11.2	11.7	0.20	1130	18.8	276	4.60
		5/27/99	8420	1.64	0.04	1.77	0.04	102	2.25	5.09	0.11	318	7.0	196	4.32
		6/2/99	5820	0.53	0.02	0.72	0.02	21.1	0.67	1.89	0.06	137	4.36	138	4.40

[1] Weak-acid digestion performed on water, suspended-sediment mixture at U.S. Geological Survey National Water-Quality Laboratory.

[2] Filtrate passing a 0.45-micrometer capsule filter.

Appendix A. Selected water-quality analyses from the U.S. Geological Survey National Water-Quality Laboratory for nine water-quality stations sampled during the 1999 snowmelt runoff, Coeur d’Alene River Basin, Idaho

12413040 SOUTH FORK COEUR D'ALENE RIVER ABOVE DEADMAN GULCH NEAR MULLAN, ID

WATER-QUALITY RECORDS

PERIOD OF RECORD.--October 1998 to current year.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS- CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE- CIFIC CON- DUCT- ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND- ARD UNITS) (00400)	TEMPER- ATURE AIR (DEG C) (00020)	TEMPER- ATURE WATER (DEG C) (00010)	HARD- NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS- SOLVED (MG/L AS CA) (00915)
OCT								
22...	1220	9.7	144	7.6	9.5	7.0	58	16
NOV								
16...	1530	76	149	7.7	2.0	5.4	56	16
DEC								
14...	1610	20	144	7.7	-1.0	2.5	52	14
JAN								
20...	0855	22	132	7.5	1.0	2.0	52	14
MAR								
22...	1115	56	115	7.7	6.5	2.0	42	11
APR								
19...	0845	115	79	7.6	4.0	3.5	32	7.9
MAY								
05...	0730	87	79	7.3	3.5	3.5	32	8.2
22...	1710	134	52	7.4	16.5	8.5	20	5.4
25...	1100	366	31	7.3	24.0	6.4	12	3.3
27...	1000	236	35	7.3	21.0	6.0	14	3.8
31...	1415	193	37	7.4	10.5	5.5	15	4.0
JUN								
16...	0755	230	32	7.2	19.5	5.9	12	3.4
JUL								
12...	1425	64	49	7.3	30.0	11.8	21	5.5
AUG								
12...	0730	22	95	7.5	13.5	10.5	39	11
31...	0730	16	115	8.0	12.0	9.5	50	13

DATE	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG) (00925)	SODIUM, DIS- SOLVED (MG/L AS NA) (00930)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)
OCT							
22...	4.6	--	--	--	--	--	--
NOV							
16...	4.1	--	--	--	--	--	--
DEC							
14...	4.1	--	--	--	--	--	--
JAN							
20...	4.1	--	--	--	--	--	--
MAR							
22...	3.7	--	--	--	--	--	--
APR							
19...	2.9	--	--	--	--	--	--
MAY							
05...	2.8	2.2	--	6.3	3.3	<.10	8.8
22...	1.7	--	15	--	--	--	--
25...	1.0	1.0	11	2.0	.77	<.10	7.0
27...	1.2	--	--	--	--	--	--
31...	1.3	--	--	--	--	--	--
JUN							
16...	.96	1.0	12	2.6	.54	<.10	7.1
JUL							
12...	1.7	1.3	20	3.1	.92	<.10	8.0
AUG							
12...	3.2	2.0	37	8.1	1.6	<.10	9.6
31...	4.0	2.2	41	11	1.8	<.10	9.8

DATE	TIME	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)
OCT							
22...	1220	<1	<1	<1	<1	<20	<10
NOV							
16...	1530	<1	<1	2	10	59	60
DEC							
14...	1610	<1	<1	<1	7	24	30
JAN							
20...	0855	<1	<1	1	4	22	20
MAR							
22...	1115	<1	<1	<1	24	<20	52.4
APR							
19...	0845	<1	<1	<1	5	E9	E32.6
MAY							
05...	0730	<1	<.1	<1	2.3	8	9.2
22...	1710	<1	<.1	<1	3.5	4	9.2
25...	1100	<1	.11	<1	12.6	3	20.0
27...	1000	<1	<.1	<1	4.7	4	9.7
31...	1415	<1	<.1	<1	2.4	4	6.3
JUN							
16...	0755	<1	<.1	<1	2.9	4	6.2
JUL							
12...	1425	<1	<.1	<1	1.8	3	4.4
AUG							
12...	0730	<1	<.1	<1	1.4	3	6.7
31...	0730	<1	<.1	<1	1.3	8	8.2

E Positive detection, but below detection limit.

12413125 CANYON CREEK ABOVE MOUTH AT WALLACE, ID

WATER-QUALITY RECORDS

PERIOD OF RECORD.--July 1972 to October 1972, October 1998 to current year.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
OCT								
26...	1315	13	127	7.8	12.5	10.0	49	14
NOV								
18...	1200	16	133	7.3	3.5	5.0	57	16
DEC								
15...	1225	25	130	7.6	2.0	2.8	48	13
28...	1415	27	128	6.7	3.5	.0	47	13
MAR								
23...	0845	96	91	7.1	6.0	3.5	31	8.7
APR								
19...	1100	138	60	7.2	8.0	5.5	22	6.2
MAY								
05...	1255	84	56	7.1	10.0	7.0	21	5.9
24...	1630	384	31	7.1	26.5	9.5	11	3.0
27...	0900	261	28	7.0	9.0	5.5	11	3.0
JUN								
02...	1030	241	31	6.0	10.0	7.0	11	3.2
15...	0915	263	31	6.9	27.0	10.0	10	2.8
JUL								
08...	1045	107	39	7.0	18.5	9.9	16	4.6
AUG								
05...	1240	34	83	7.4	25.0	17.5	35	9.9
30...	1325	22	103	7.3	19.0	17.0	44	13

DATE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT							
26...	3.5	--	--	--	--	--	--
NOV							
18...	4.1	--	--	--	--	--	--
DEC							
15...	3.4	--	--	--	--	--	--
28...	3.4	--	--	--	--	--	--
MAR							
23...	2.2	--	--	--	--	--	--
APR							
19...	1.6	--	--	--	--	--	--
MAY							
05...	1.5	1.2	--	9.0	.27	<.10	8.4
24...	.75	.77	10	5.1	.49	<.10	6.8
27...	.75	--	--	--	--	--	--
JUN							
02...	.81	--	--	--	--	--	--
15...	.69	.66	8	3.3	.18	<.10	6.2
JUL							
08...	1.2	.81	16	4.3	.16	<.10	6.4
AUG							
05...	2.5	1.3	28	11	.36	<.10	8.1
30...	3.2	1.4	35	15	E.25	<.10	8.5

DATE	TIME	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)
OCT							
26...	1315	21	18	31	43	2400	2300
NOV							
18...	1200	31	--	32	49	4300	3900
DEC							
15...	1225	28	31	29	52	4300	4400
28...	1415	30	32	31	230	4400	4200
MAR							
23...	0845	26	26	40	120	3600	3560
APR							
19...	1100	14	15	22	370	1800	1890
MAY							
05...	1255	9	9.4	22	55.1	1290	1280
24...	1630	6	10.8	26	2000	671	1440
27...	0900	5	5.1	17	251	604	663
JUN							
02...	1030	4	4.6	23	98.9	571	568
15...	0915	4	4.1	18	151	451	466
JUL							
08...	1045	5	5.4	20	33.2	702	664
AUG							
05...	1240	12	12.6	31	58.9	1480	1390
30...	1325	15	15.0	37	50.5	1790	1780

E Positive detection, but below detection limit.

12413130 NINEMILE CREEK ABOVE MOUTH AT WALLACE, ID

WATER-QUALITY RECORDS

PERIOD OF RECORD.--July 1972 to October 1972, October 1998 to current year.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
OCT								
27...	1135	3.2	157	7.5	14.5	7.0	61	17
NOV								
19...	0855	4.0	182	7.3	2.5	3.5	75	21
DEC								
10...	0805	6.0	201	7.8	-1.0	1.0	74	20
JAN								
21...	1125	13	158	7.4	3.5	3.0	71	19
MAR								
22...	1405	78	130	7.5	11.0	6.0	56	15
APR								
19...	1300	80	117	7.6	8.0	5.5	48	13
MAY								
05...	1400	34	109	7.5	10.0	6.0	43	12
23...	1355	61	63	7.3	29.0	12.0	24	6.7
26...	0845	123	42	6.8	10.5	5.2	16	4.4
27...	0745	110	43	7.1	5.0	5.0	16	4.5
31...	1230	55	48	7.3	12.0	7.3	17	4.7
JUN								
15...	1415	49	44	7.3	29.5	15.2	16	4.5
JUL								
07...	1425	17	74	7.2	24.0	14.0	27	7.8
AUG								
04...	1540	8.6	109	7.1	28.0	22.0	44	13
SEP								
01...	1000	5.0	129	7.1	10.0	7.5	53	15

DATE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT							
27...	4.3	--	--	--	--	--	--
NOV							
19...	5.1	--	--	--	--	--	--
DEC							
10...	5.5	--	--	--	--	--	--
JAN							
21...	5.4	--	--	--	--	--	--
MAR							
22...	4.7	--	--	--	--	--	--
APR							
19...	3.9	--	--	--	--	--	--
MAY							
05...	3.5	1.6	--	16	.88	<.10	13
23...	1.8	--	18	--	--	--	--
26...	1.1	1.2	13	6.7	.26	<.10	10
27...	1.1	--	--	--	--	--	--
31...	1.2	--	--	--	--	--	--
JUN							
15...	1.1	1.2	13	6.4	.24	<.10	10
JUL							
07...	1.9	1.5	24	10	.34	<.10	12
AUG							
04...	3.1	1.9	32	19	.61	<.10	14
SEP							
01...	3.7	2.0	39	23	.37	<.10	14

DATE	TIME	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)
OCT							
27...	1135	28	31	28	46	4900	--
NOV							
19...	0855	39	--	36	50	7500	7100
DEC							
10...	0805	31	39	36	68	6600	7000
JAN							
21...	1125	22	21	44	54	3800	3800
MAR							
22...	1405	12	14	23	330	2000	2300
APR							
19...	1300	14	17	13	260	2400	2580
MAY							
05...	1400	16	16.8	26	52.2	2690	2580
23...	1355	8	9.3	23	223	1240	1300
26...	0845	6	9.3	23	804	981	1480
27...	0745	6	7.3	23	267	1020	1100
31...	1230	6	6.5	22	104	974	946
JUN							
15...	1415	6	6.0	25	80.5	864	870
JUL							
07...	1425	10	10.6	29	45.6	1570	1760
AUG							
04...	1540	17	17.7	33	48.2	2280	2250
SEP							
01...	1000	21	--	29	--	3570	--

12413150 SOUTH FORK COEUR D'ALENE RIVER AT SILVERTON, ID

WATER-QUALITY RECORDS

PERIOD OF RECORD.--October 1998 to current year.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
OCT								
22...	1540	43	174	7.9	14.0	9.5	69	19
NOV								
17...	0925	68	175	7.1	5.5	5.0	69	19
DEC								
10...	1210	81	184	7.4	2.0	3.5	64	17
29...	1300	129	164	7.9	5.0	2.0	59	16
MAR								
24...	0830	525	122	7.3	11.0	3.8	46	13
APR								
19...	1515	731	85	7.6	12.0	5.0	48	13
MAY								
05...	1445	479	85	7.6	10.0	6.0	37	9.9
24...	1030	1220	52	7.2	26.5	6.5	22	6.1
26...	0800	1570	44	6.8	10.5	4.5	18	5.0
27...	0945	1230	51	7.1	14.0	5.0	21	5.8
JUN								
01...	0845	1040	53	7.5	12.5	5.5	23	6.2
16...	0950	1180	43	7.4	25.0	8.0	18	5.0
JUL								
15...	0800	282	75	7.9	12.0	9.0	32	8.7
AUG								
05...	1540	133	112	7.7	27.0	18.0	48	13
SEP								
01...	0840	77	140	7.2	7.0	8.0	61	17

DATE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT							
22...	5.5	--	--	--	--	--	--
NOV							
17...	5.2	--	--	--	--	--	--
DEC							
10...	5.1	--	--	--	--	--	--
29...	4.6	--	--	--	--	--	--
MAR							
24...	3.6	--	--	--	--	--	--
APR							
19...	4.0	--	--	--	--	--	--
MAY							
05...	2.9	1.9	--	7.2	1.7	<.10	8.5
24...	1.6	--	21	--	--	--	--
26...	1.3	.84	16	3.7	.46	<.10	6.7
27...	1.6	--	--	--	--	--	--
JUN							
01...	1.7	--	--	--	--	--	--
16...	1.3	.82	22	3.2	.40	<.10	6.4
JUL							
15...	2.4	1.5	27	6.8	.98	<.10	7.2
AUG							
05...	3.8	2.4	39	12	1.8	<.10	8.6
SEP							
01...	4.9	3.2	48	18	2.3	<.10	9.1

DATE	TIME	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)
OCT							
22...	1540	8	8	11	18	1200	1100
NOV							
17...	0925	12	11	10	23	1900	1700
DEC							
10...	1210	11	11	14	24	1700	1700
29...	1300	8	8	6	33	1300	--
MAR							
24...	0830	7	8	8	49	1100	1050
APR							
19...	1515	5	5	4	13	700	689
MAY							
05...	1445	3	3.6	7	17.1	543	503
24...	1030	2	3.3	5	387	244	453
26...	0800	1	4.1	5	539	204	520
27...	0945	2	2.2	4	107	247	292
JUN							
01...	0845	2	1.9	5	36.9	253	265
16...	0950	1	1.6	4	108	181	216
JUL							
15...	0800	3	3.2	7	18.9	427	417
AUG							
05...	1540	5	5.0	15	42.4	564	539
SEP							
01...	0840	7	6.9	13	18.6	1040	901

12413210 SOUTH FORK COEUR D'ALENE AT ELIZABETH PARK NEAR KELLOGG, ID

WATER-QUALITY RECORDS

PERIOD OF RECORD.--October 1992 to current year.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
OCT								
19...	1610	68	210	7.7	5.0	10.5	72	19
NOV								
17...	1600	94	196	7.8	5.5	6.5	70	19
DEC								
15...	1445	200	162	7.5	4.0	4.5	58	16
JAN								
21...	1320	358	135	7.5	5.5	4.5	50	13
FEB								
10...	0715	235	159	7.6	-1.0	2.0	58	15
MAR								
09...	0745	254	148	7.4	3.0	2.5	58	15
APR								
12...	1515	355	126	7.6	11.0	6.9	35	9.5
20...	0740	1320	74	7.1	6.0	5.5	30	8.0
MAY								
06...	0745	664	97	7.4	.0	4.0	38	10
25...	1345	2460	44	7.3	25.0	9.0	18	5.1
27...	1500	1740	55	7.2	27.5	10.0	22	6.0
JUN								
01...	1610	1450	56	7.4	17.0	8.5	22	6.1
JUL								
15...	1015	406	86	7.2	18.0	10.5	34	9.1
AUG								
09...	1645	168	147	7.6	28.0	19.0	54	14
30...	1505	113	178	7.3	19.5	16.5	65	17

DATE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT							
19...	5.9	--	--	--	--	--	--
NOV							
17...	5.6	--	--	--	--	--	--
DEC							
15...	4.7	--	--	--	--	--	--
JAN							
21...	4.1	--	--	--	--	--	--
FEB							
10...	4.8	--	--	--	--	--	--
MAR							
09...	4.7	--	--	--	--	--	--
APR							
12...	2.7	--	--	--	--	--	--
20...	2.4	--	--	--	--	--	--
MAY							
06...	3.1	3.0	--	12	1.7	<.10	9.1
25...	1.4	1.1	18	4.9	.58	<.10	8.6
27...	1.7	--	--	--	--	--	--
JUN							
01...	1.7	1.4	20	<.10	<.10	<.10	8.6
JUL							
15...	2.6	2.5	29	11	1.1	<.10	7.9
AUG							
09...	4.3	6.1	39	26	2.0	<.10	9.4
30...	5.4	8.1	43	36	2.3	<.10	9.8

DATE	TIME	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)
OCT							
19...	1610	8	9	5	10	1100	1000
NOV							
17...	1600	10	9	5	14	1400	1400
DEC							
15...	1445	7	7	4	8	1100	1100
JAN							
21...	1320	5	5	4	8	780	820
FEB							
10...	0715	7	7	3	8	1100	1000
MAR							
09...	0745	6	7	4	11	1100	1000
APR							
12...	1515	4	5	5	130	660	727
20...	0740	3	5	4	260	510	668
MAY							
06...	0745	4	3.7	4	16.2	561	505
25...	1345	1	4.2	3	336	184	598
27...	1500	2	2.4	4	180	228	327
JUN							
01...	1610	2	1.9	4	38.9	237	248
JUL							
15...	1015	3	3.5	6	14.6	444	432
AUG							
09...	1645	6	5.8	8	14.4	714	655
30...	1505	6	6.6	8	11.6	819	728

12413445 PINE CREEK BELOW AMY GULCH NEAR PINEHURST, ID

WATER-QUALITY RECORDS

PERIOD OF RECORD.--October 1998 to current year.

PERIOD OF DAILY RECORD.--February to September current year.

PERIOD OR DAILY RECORD.--
WATER TEMPERATURES: February to September current year.
SPECIFIC CONDUCTANCE: February to September current year.

INSTRUMENTATION.--Water-quality data recorder since February 1999.

REMARKS.--Missing data due to equipment damage.

EXTREMES FOR CURRENT YEAR--
WATER TEMPERATURES: Maximum recorded, 15.5 ^{o}C Aug. 2-4, 6, 8-10, 18-20, 23, 26; minimum recorded, 2.0 ^{o}C on March 6-8.
SPECIFIC CONDUCTANCE: Maximum recorded daily mean, 34 micromhos/cm Sep. 22; minimum recorded daily mean, 15 micromhos/cm May 24-30, June 16-17.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	HARD-NESS TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
OCT								
21...	1715	13	40	7.1	10.5	11.5	15	3.8
NOV								
19...	1353	33	47	6.7	5.0	9.0	16	4.0
DEC								
09...	0845	73	47	7.1	.0	6.0	12	3.1
29...	0815	145	34	7.7	1.5	4.0	12	3.0
FEB								
24...	1440	788	26	7.1	6.0	3.0	9	2.3
APR								
20...	0745	833	21	6.9	8.0	5.0	7	1.7
MAY								
06...	0710	298	21	6.3	3.0	4.0	7	1.8
19...	1545	569	20	6.5	15.0	8.0	7	1.7
25...	1100	1340	16	7.3	6.7	8.2	5	1.4
27...	1310	716	17	6.9	17.5	8.5	6	1.5
JUN								
01...	1815	593	17	6.6	16.0	8.0	6	1.5
16...	1215	594	17	7.1	27.5	10.4	6	1.6
JUL								
20...	1045	55	25	6.8	22.5	12.5	9	2.4
AUG								
11...	1550	36	31	6.7	23.0	13.0	11	2.8
31...	1200	21	32	6.7	12.5	11.5	12	3.0

DATE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT							
21...	1.2	--	--	--	--	--	--
NOV							
19...	1.4	--	--	--	--	--	--
DEC							
09...	1.1	--	--	--	--	--	--
29...	1.0	--	--	--	--	--	--
FEB							
24...	.82	--	--	--	--	--	--
APR							
20...	.58	--	--	--	--	--	--
MAY							
06...	.60	.85	--	2.4	.16	<.10	8.8
19...	.54	--	--	--	--	--	--
25...	.42	.74	6	1.3	.17	<.10	6.9
27...	.45	--	--	--	--	--	--
JUN							
01...	.47	--	--	--	--	--	--
16...	.48	.68	7	.97	.12	<.10	7.1
JUL							
20...	.78	.94	10	2.3	.14	<.10	9.0
AUG							
11...	.93	1.1	10	3.3	.18	<.10	10
31...	.99	1.2	11	4.3	E.16	<.10	10

DATE	TIME	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)
OCT							
21...	1715	<1	<1	<1	<1	140	--
NOV							
19...	1353	<1	<1	<1	<1	140	140
DEC							
09...	0845	<1	<1	<1	<1	140	140
29...	0815	<1	<1	<1	2	170	--
FEB							
24...	1440	<1	<1	<1	14	140	151
APR							
20...	0745	<1	<1	<1	4	120	127
MAY							
06...	0710	<1	--	<1	.93	95	94.5
19...	1545	<1	--	<1	.78	68	67.9
25...	1100	<1	--	<1	31.2	39	76.1
27...	1310	<1	--	<1	4.0	40	42.3
JUN							
01...	1815	<1	--	<1	1.4	40	41.5
16...	1215	<1	--	<1	.80	35	33.9
JUL							
20...	1045	<1	--	<1	--	87	84.0
AUG							
11...	1550	<1	--	<1	--	96	94.3
31...	1200	<1	--	<1	.59	108	102

E Positive detection, but below stated detection limits.

12413470 SOUTH FORK COEUR D'ALENE RIVER NEAR PINEHURST, ID

WATER-QUALITY RECORDS

PERIOD OF RECORD.--July 1989 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: May 19 to September 1998, March to September 1999 (discontinued).
SPECIFIC CONDUCTANCE: March 4 to September 30 1999.

INSTRUMENTATION.--Water quality data logger from March to September 1999.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum, 23.7 °C July 27, 1998.

EXTREMES FOR CURRENT PERIOD.--
WATER TEMPERATURES: Maximum, 21.7 °C Aug. 3.
SPECIFIC CONDUCTANCE: Maximum daily mean, 327 microsiemens, Sep. 27, 1999, minimum daily mean, 47 microsiemens May 25, 1999.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT											
26...	1015	98	252	7.1	11.5	10.0	--	--	--	--	--
NOV											
17...	1250	164	268	7.2	6.0	7.0	--	--	--	--	--
DEC											
30...	1445	1200	105	7.4	4.0	3.0	--	--	--	--	--
FEB											
08...	1500	527	140	7.0	2.0	5.0	--	--	--	--	--
MAR											
09...	0925	440	144	7.2	8.0	3.5	--	--	--	--	--
APR											
13...	0730	610	147	7.2	6.0	4.1	1.3	11.8	97	K2	K8
MAY											
06...	1330	1160	95	7.3	18.0	8.8	1.8	11.8	111	<1	K6
JUN											
02...	0745	2160	56	6.2	13.5	7.0	4.0	--	--	K5	28
JUL											
15...	1200	508	109	7.1	24.0	13.0	2.0	10.2	106	K1	K4
AUG											
09...	1415	237	176	7.3	30.0	19.0	.65	7.7	91	K3	K3
SEP											
07...	1430	140	305	7.2	18.0	14.5	.44	10.8	113	<1	K16

DATE	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM PERCENT (00932)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ANC WATER UNFLTRD FET FIELD MG/L AS HCO3 (00440)	ANC UNFLTRD CARB FET FIELD MG/L AS CO3 (00445)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
OCT											
26...	90	23	7.7	--	--	--	--	--	--	--	--
NOV											
17...	96	25	8.3	--	--	--	--	--	--	--	--
DEC											
30...	36	10	2.7	--	--	--	--	--	--	--	--
FEB											
08...	51	13	4.3	--	--	--	--	--	--	--	--
MAR											
09...	54	14	4.6	--	--	--	--	--	--	--	--
APR											
13...	53	14	4.4	--	--	--	--	--	--	--	--
MAY											
06...	35	9.3	2.9	2.4	--	--	27	0	22	18	2.2
JUN											
02...	22	5.9	1.6	1.3	--	--	16	0	14	9.4	.54
JUL											
15...	41	11	3.3	2.5	--	--	--	--	25	21	1.1
AUG											
09...	64	17	5.3	5.3	--	--	--	--	32	42	2.5
SEP											
07...	120	32	10	6.5	10	1.4	39	0	32	100	2.3

K Results based on counts outside ideal colony range.

112413470 SOUTH FORK COEUR D'ALENE RIVER NEAR PINEHURST, ID--Continued

WATER-QUALITY DATA, WATERYEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L) (70301)	SOLIDS, DIS- SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS- SOLVED (TONS PER DAY) (70302)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
OCT										
26...	--	--	--	--	--	.348	.348	.50	.095	.035
NOV										
17...	--	--	--	--	--	.363	.310	.42	.048	.019
DEC										
30...	--	--	--	--	--	.176	.061	.16	.041	.009
FEB										
08...	--	--	--	--	--	.211	.068	.11	.025	.010
MAR										
09...	--	--	--	--	--	.203	.061	.23	.024	.008
APR										
13...	--	--	--	--	--	.139	.047	E.06	.018	.006
MAY										
06...	<.10	9.5	--	--	--	.061	.036	E.08	.016	.006
JUN										
02...	<.10	7.3	--	--	--	.035	.013	.12	.023	.004
JUL										
15...	.10	8.5	--	--	--	.044	.052	E.09	.021	.007
AUG										
09...	.20	10	--	--	--	.178	.119	.16	.040	.011
SEP										
07...	.29	11	186	.25	70.3	.252	.228	.33	.050	.016

DATE	TIME	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	SEDI- MENT, SUS- PENDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY) (80155)
OCT									
26...	1015	11	14	14	150	2130	2300	--	--
NOV									
17...	1250	15	16	5.7	63	1910	2000	--	--
DEC									
30...	1445	4.9	6	2.7	200	661	700	--	--
FEB									
08...	1500	11	11	3.3	16	1180	1300	--	--
MAR									
09...	0925	8.7	9	5.1	15	1310	1200	--	--
APR									
13...	0730	6.2	7	3.6	21	979	950	3	4.9
MAY									
06...	1330	3.8	4	5.0	44	601	590	7	22
JUN									
02...	0745	2.1	3	3.6	130	317	360	31	181
JUL									
15...	1200	4.2	5	6.7	29	714	660	3	4.1
AUG									
09...	1415	7.4	8	7.9	26	1210	1100	2	1.3
SEP									
07...	1430	7.5	8	4.5	19	1340	1400	1	.38

E Positive detection but below stated detection limit.

12413000 NORTH FORK COEUR D'ALENE RIVER AT ENAVILLE, ID

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1972-73, 1975-1980, 1990, October 1992 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: May 20 to September 30, 1998, May to September 1999 (discontinued).

INSTRUMENTATION.--Temperature recording data logger.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum 21.9 °C July 27, 1998.

EXTREMES FOR CURRENT PERIOD.--
WATER TEMPERATURES: Maximum 20.2 °C Aug. 3.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF COLS./100 ML) (31625)
OCT										
20...	1530	254	50	7.5	12.5	10.5	--	--	--	--
NOV										
17...	0900	592	53	7.0	3.5	6.0	--	--	--	--
DEC										
15...	0800	1940	40	7.2	.0	3.2	--	--	--	--
JAN										
27...	1130	1840	40	7.3	-2.0	1.5	--	--	--	--
FEB										
08...	1255	1540	41	7.2	9.0	3.0	--	--	--	--
MAR										
08...	1445	1940	41	7.4	5.0	3.0	--	--	--	--
APR										
13...	1030	2740	44	7.3	10.5	3.9	1.2	12.2	101	<1
20...	1120	9680	30	7.2	13.0	5.0	--	--	--	--
MAY										
06...	1010	5180	35	7.2	11.0	4.9	2.0	12.0	103	K1
27...	1430	8450	27	7.3	24.5	8.5	--	--	--	--
JUN										
02...	1015	5810	32	7.3	19.0	8.1	1.9	--	--	K1
JUL										
13...	0740	902	45	7.5	15.5	13.9	1.9	8.9	94	K7
AUG										
10...	0745	504	51	7.2	17.0	15.3	.36	8.3	90	K5
SEP										
08...	1245	306	53	7.8	21.5	13.0	.22	9.6	100	K1

DATE	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM PERCENT (00932)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ANC WATER UNFLTRD FET FIELD MG/L AS HCO3 (00440)	ANC UNFLTRD CARB FET FIELD MG/L AS CO3 (00445)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)
OCT										
20...	--	23	5.6	2.2	--	--	--	--	--	--
NOV										
17...	--	23	5.7	2.2	--	--	--	--	--	--
DEC										
15...	--	19	4.5	1.8	--	--	--	--	--	--
JAN										
27...	--	18	4.3	1.7	--	--	--	--	--	--
FEB										
08...	--	19	4.6	1.8	--	--	--	--	--	--
MAR										
08...	--	18	4.3	1.7	--	--	--	--	--	--
APR										
13...	K4	17	4.2	1.7	--	--	--	--	--	--
20...	--	13	3.1	1.2	--	--	--	--	--	--
MAY										
06...	K1	14	3.4	1.4	.93	--	--	19	0	16
27...	--	12	2.9	1.1	--	--	--	--	--	--
JUN										
02...	K1	13	3.1	1.2	.85	--	--	17	0	14
JUL										
13...	28	19	4.7	1.8	1.0	--	--	25	0	21
AUG										
10...	K9	22	5.3	2.0	1.1	--	--	29	0	24
SEP										
08...	K5	23	5.5	2.1	1.2	10	.44	29	0	24

K Results based on counts outside ideal colony range.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DATE	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N) (00631)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N) (00608)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS- PHORUS TOTAL (MG/L AS P) (00665)	PHOS- PHORUS ORTHO, DIS- SOLVED (MG/L AS P) (00671)
OCT									
20...	--	--	--	--	.013	<.002	<.10	.002	.001
NOV									
17...	--	--	--	--	.059	<.002	<.10	.004	.001
DEC									
15...	--	--	--	--	.042	<.002	.10	.007	.003
JAN									
27...	--	--	--	--	.024	.004	E.06	.005	.003
FEB									
08...	--	--	--	--	.013	<.002	<.10	.004	.003
MAR									
08...	--	--	--	--	.005	<.002	<.10	<.004	.001
APR									
13...	--	--	--	--	.005	.004	<.10	.005	.002
20...	--	--	--	--	--	--	--	--	--
MAY									
06...	1.5	.19	<.10	9.7	.008	.002	E.05	.008	.003
27...	--	--	--	--	--	--	--	--	--
JUN									
02...	1.6	.38	<.10	8.7	.017	.003	.13	.007	.003
JUL									
13...	1.2	.14	<.10	10	<.005	<.002	<.10	.004	.002
AUG									
10...	1.3	.18	<.10	10	<.005	<.002	<.10	<.004	.001
SEP									
08...	1.7	E.15	<.10	10	.005	.007	.11	<.004	.003

DATE	TIME	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)	SEDI- MENT, SUS- PENDED (MG/L) (80154)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY) (80155)
OCT									
20...	1530	<1	<1	<1	<1	<20	<10	--	--
NOV									
17...	0900	<1	<1	<1	<1	E8	<10	--	--
DEC									
15...	0800	<1	<1	<1	<1	<20	<10	--	--
JAN									
27...	1130	<1	<1	<1	<1	<20	<10	--	--
FEB									
08...	1255	<1	<1	<1	<1	<20	<10	--	--
MAR									
08...	1445	<1	<1	<1	<1	<20	<40	--	--
APR									
13...	1030	<1	<1	<1	<1	<20	<40	2	15
20...	1120	<1	<1	<1	3	<20	<40	37	967
MAY									
06...	1010	<1	<.1	<1	.78	4	6.9	3	42
27...	1430	<1	<.1	<1	2.2	4	--	--	--
JUN									
02...	1015	<1	<.1	<1	.67	4	4.4	5	78
JUL									
13...	0740	<1	<.1	<1	.17	5	4.8	<1	--
AUG									
10...	0745	<1	<.1	<1	.14	3	3.2	22	30
SEP									
08...	1245	<1	<.1	<1	.10	3	2.4	<1	--

E Positive detection, but below stated deteciton limit.

Water quality partial-record stations and miscellaneous sites are locations where chemical-quality, biological, or sediment data are collected once only, intermittently, or systematically but at limited frequency over a period of years for use in hydrologic analyses.

WATER QUALITY DATA, MAY TO JUNE 1999

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	ANC WATER UNFLTRD FET FIELD MG/L AS CACO3 (00410)
SPOKANE RIVER BASIN											
12411950 BEAVER CR AB CARPENTER GULCH NR PRICHARD, ID (LAT 47 37 59N LONG 115 58 46W)											
MAY											
24...	0920	140	49.0	7.06	16.0	8.00	21	5.5	1.7	1.2	14
12413025 LITTLE NORTH FORK AT HALE FISH HATCHERY AB MOUTH, ID (LAT 47 27 54N LONG 115 43 18W)											
MAY											
22...	1030	47	19.0	6.90	16.5	5.00	7	1.7	.68	.9	7
12413030 SF COEUR D ALENE R BL OBRIEN GULCH NR LARSON, ID (LAT 47 28 00N LONG 115 43 58W)											
MAY											
22...	1355	110	33.0	7.11	18.0	7.50	13	3.4	1.0	1.3	11
25...	1750	154	26.0	7.30	22.5	6.30	8	2.3	.67	.9	10
12413103 SF COEUR D ALENE R AB SLAUGHTERHSE GULCH AT MULLAN, ID (LAT 47 27 58N LONG 115 48 48W)											
MAY											
24...	1450	470	43.0	7.80	26.4	7.30	18	5.2	1.3	1.0	20
12413104 SF COEUR D ALENE R BL TROWBRIDGE GULCH NR WALLACE, ID (LAT 47 28 27N LONG 115 52 07W)											
MAY											
24...	1600	470	55.0	7.70	25.3	7.80	23	6.3	1.8	1.1	23
12413120 CANYON CREEK AT GEM, ID (LAT 47 30 30N LONG 115 52 01W)											
MAY											
24...	1100	310	27.0	6.66	23.5	6.20	10	2.7	.68	.7	10
12413126 NINEMILE CR AB MOUTH OF EF NINEMILE CR NR BLACKCLOUD, ID (LAT 47 30 51N LONG 115 53 52W)											
MAY											
23...	1120	5.6	180	8.01	22.5	8.80	95	23	9.4	1.1	88
124131267 EF NINEMILE CREEK NR BLACKCLOUD, ID (LAT 47 31 27N LONG 115 52 49W)											
MAY											
23...	0810	38	35.0	6.34	9.50	4.50	10	3.2	.53	1.4	6
12413131 SF COEUR D ALENE R ABV PLACER CR AT WALLACE, ID (LAT 47 28 30N LONG 115 55 39W)											
MAY											
24...	1300	1200	52.0	7.60	20.0	8.10	21	5.8	1.6	1.1	21
12413151 LAKE CREEK AB MOUTH NR SILVERTON, ID (LAT 47 29 24N LONG 115 57 06W)											
MAY											
22...	0950	30	64.0	7.83	15.0	7.00	27	7.0	2.3	1.9	22
12413168 TWOMILE CREEK AB MOUTH AT OSBURN, ID (LAT 47 30 35N LONG 115 59 43W)											
MAY											
22...	1145	4.8	58.0	7.18	20.5	11.5	23	6.9	1.4	1.6	16
12413169 SF COEUR D ALENE R BLW TWOMILE CR NR OSBURN, ID (LAT 47 30 36N LONG 115 59 47W)											
MAY											
05...	1610	533	--	--	--	--	38	10	3.0	2.0	--
24...	1210	1400	53.0	7.27	28.0	8.70	22	6.2	1.7	--	21
26...	1030	1800	47.0	6.88	18.0	8.50	19	5.2	1.4	.9	21
27...	1200	1400	48.0	7.47	24.5	7.80	22	6.0	1.6	--	--
JUN											
01...	1215	1000	56.0	7.52	16.5	7.20	23	6.4	1.8	--	--
12413174 TERROR GULCH CREEK AB MOUTH NR OSBURN, ID (LAT 47 30 52N LONG 116 01 17W)											
MAY											
22...	1355	1.0	95.0	7.33	23.0	14.5	35	7.4	3.9	3.2	19
12413175 SF COEUR D ALENE R AT TERROR GULCH AT OSBURN, ID (LAT 47 30 52N LONG 116 01 20W)											
MAY											
24...	1425	1500	54.0	7.51	31.0	9.50	22	6.2	1.7	1.0	22
3412413179 SF COEUR D ALENE R AB BIG CREEK NR BIG CREEK, ID (LAT 47 31 38N LONG 116 02 56W)											
MAY											
24...	1640	1700	55.0	7.60	31.5	10.5	23	6.3	1.7	1.0	22

WATER QUALITY DATA, MAY TO JUNE 1999

DATE	SULFATE DIS- SOLVED (MG/L AS SO4) (00945)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL) (00940)	FLUO- RIDE, DIS- SOLVED (MG/L AS F) (00950)	SILICA, DIS- SOLVED (MG/L AS SIO2) (00955)	CADMIUM DIS- SOLVED (UG/L AS CD) (01025)	CADMIUM WATER UNFLTRD TOTAL (UG/L AS CD) (01027)	LEAD, DIS- SOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB) (01051)	ZINC, DIS- SOLVED (UG/L AS ZN) (01090)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN) (01092)
SPOKANE RIVER BASIN										
12411950 BEAVER CR AB CARPENTER GULCH NR PRICHARD, ID (LAT 47 37 59N LONG 115 58 46W)										
MAY										
24...	6.4	.3	<.1	11	<1	.31	<1	4.4	59	69.3
12413025 LITTLE NORTH FORK AT HALE FISH HATCHERY AB MOUTH, ID (LAT 47 27 54N LONG 115 43 18W)										
MAY										
22...	1.7	.1	<.1	7.2	<1	<.1	<1	.20	1	<1.0
12413030 SF COEUR D ALENE R BL OBRIEN GULCH NR LARSON, ID (LAT 47 28 00N LONG 115 43 58W)										
MAY										
22...	1.7	1.3	<.1	7.3	<1	<.1	<1	1.6	3	5.1
25...	1.3	.7	<.1	6.7	<1	.14	<1	11.2	5	25.7
12413103 SF COEUR D ALENE R AB SLAUGHTERHSE GULCH AT MULLAN, ID (LAT 47 27 58N LONG 115 48 48W)										
MAY										
24...	2.1	.8	<.1	6.2	<1	.31	<1	82.7	7	78.0
12413104 SF COEUR D ALENE R BL TROWBRIDGE BULCH NR WALLACE, ID (LAT 47 28 27N LONG 115 52 07W)										
MAY										
24...	3.5	.8	<.1	6.3	<1	.88	<1	84.6	45	126
12413120 CANYON CREEK AT GEM, ID (LAT 47 30 30N LONG 115 52 01W)										
MAY										
24...	3.8	.5	<.1	6.5	3	3.9	14	477	340	481
12413126 NINEMILE CR AB MOUTH OF EF NINEMILE CR NR BLACKCLOUD, ID (LAT 47 30 51N LONG 115 53 52W)										
MAY										
23...	.2	.4	<.1	12	<1	.17	1	2.5	22	22.3
124131267 EF NINEMILE CREEK NR BLACKCLOUD, ID (LAT 47 31 27N LONG 115 52 49W)										
MAY										
23...	8.2	.2	<.1	11	8	10.5	25	619	1380	1730
12413131 SF COEUR D ALENE R ABV PLACER CR AT WALLACE, ID (LAT 47 28 30N LONG 115 55 39W)										
MAY										
24...	4.7	.8	<.1	7.2	2	4.1	9	480	319	558
12413151 LAKE CREEK AB MOUTH NR SILVERTON, ID (LAT 47 29 24N LONG 115 57 06W)										
MAY										
22...	7.9	.9	<.1	7.6	<1	<.1	<1	4.4	10	6.2
12413168 TWOMILE CREEK AB MOUTH AT OSBURN, ID (LAT 47 30 35N LONG 115 59 43W)										
MAY										
22...	9.3	.5	<.1	15	<1	<.1	<1	.31	2	1.5
12413169 SF COEUR D ALENE R BLW TWOMILE CR NR OSBURN, ID (LAT 47 30 36N LONG 115 59 47W)										
MAY										
05...	8.4	1.8	<.1	8.8	4	3.8	6	16.4	552	507
24...	--	--	--	--	2	3.6	5	376	250	501
26...	4.5	.5	<.1	<.1	2	3.9	4	500	222	629
27...	--	--	--	--	2	2.5	4	159	257	346
JUN										
01...	--	--	--	--	2	2.1	6	38.9	267	284
12413174 TERROR GULCH CREEK AB MOUTH NR OSBURN, ID (LAT 47 30 52N LONG 116 01 17W)										
MAY										
22...	21	1.2	<.1	21	<1	<.1	<1	.47	23	23.6
12413175 SF COEUR D ALENE R AT TERROR GULCH AT OSBURN, ID (LAT 47 30 52N LONG 116 01 20W)										
MAY										
24...	4.7	.7	<.1	7.1	2	3.9	6	477	251	534
12413179 SF COEUR D ALENE R AB BIG CREEK NR BIG CREEK, ID (LAT 47 31 38N LONG 116 02 56W)										
MAY										
24...	5.1	1.4	<.1	6.8	2	5.8	7	854	263	692

Woods, P.F. / Concentrations and Loads of Cadmium, Lead, and Zinc, 1999 Snowmelt Runoff, Nine Stations, Coeur d’Alene River Basin, Idaho / OFR 00–310